BRITISH RED CROSS SOCIETY

NURSING MANUAL

No. 2

Third Edition

By

SIR JAMES CANTLIE

K.B.E., M.A., M.B., F.R.C.S., VD.

AND

ERNEST COWELL

D.S.O., M.D., B.S., F.R.C.S.Eng.

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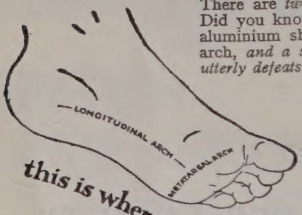

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PREFACE TO THE THIRD EDITION

Several minor errata which appeared in the Second Edition of the Nursing Manual have been corrected in this Edition.

The chapter on Infectious Diseases has been brought up to date, and paragraphs have been added on Diphtheria, Encephalitis lethargica, Erysipelas and Influenza. Owing to recent advances it has been found necessary to rewrite the paragraph on Vitamins.

I wish to express my thanks to Dr. O. M. Holden and Dr. H. W. Southgate for help in preparing these new paragraphs.

Experience as County Controller has shown that members of V.A. Detachments tend in some cases to rely too much on book knowledge. Every opportunity should be seized for undertaking practical Nursing. Experience and knowledge will only be thoroughly acquired by tending patients in hospital wards.

Ernest Cowell.

31, Wimpole St., W.
October, 1929.

PREFACE TO THE SECOND EDITION

The Education Committee of the British Red Cross Society has asked the present Author to re-edit the Nursing Manual written by the late Sir James Cantlie and first published in 1912. The general arrangement has been left intact. Certain paragraphs have been omitted and fresh ones written, bringing the manual up to date. Several new illustrations have been included. Selected paragraphs have been starred to indicate that the subject matter is suitable for those more advanced readers who have passed their first examination.

The Author wishes to acknowledge the assistance of Miss Keyes-Wells, R.R.C., Matron of Croydon General Hospital, who has contributed many suggestions dealing with the practical side of the subject.

Most of the added illustrations of instruments and surgical apparatus have been kindly supplied by Messrs. Mayer and Phelps, of New Cavendish Street, London, to whom the Author wishes to express his best thanks.

Ernest Cowell.

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NURSING MANUAL

[*Starred paragraphs are those for advanced readers*]

CHAPTER I

THE NURSE

Theory and Practice.—No man or woman can become an efficient hospital orderly or nurse merely by listening to a course of lectures or by reading a textbook on Nursing. On the other hand, without instruction by lectures and reading, experience is but ill-founded and is calculated to develop a mere "hospital hand," in contradistinction to an intelligent assistant to the physician or surgeon in charge of the patient. Doctors have to serve a long and arduous course of training before they are allowed to treat disease, and similarly, those intending to nurse the sick must have the science of their calling taught them before they are qualified to practise the art. The members of Voluntary Aid Detachments are therefore required to attain an exact knowledge of the principles of nursing as a preliminary step to the important work which they may be called upon to do later.

Nurses, in their training, are instructed to look after their own health. Sufficient time for rest and sleep must be allowed for, and a reasonable amount of out-of-door exercise should be taken. In the same manner, when a member of the family takes up attendance upon a sick relative during a long-continued illness, times for sleep and exercise must be planned out and adhered to, otherwise the nurse's health will suffer, her efficiency will be impaired, and the patient's state will, in consequence, be adversely affected.

The nurse should have a bath daily, if at al

possible; and her meals must be arranged for at regular hours.

The Nurse's Uniform.—The dress should be of washing material, which when ironed should present a smooth surface. It must be made as plainly as possible with the bottom of the skirt at least 7 inches off the ground. The sleeves are made to allow of their being turned up above the elbow, or they may be cut short and worn with detachable sleevelets. The dress is protected by a linen apron which should be kept scrupulously clean. A collar and white washable cap should be worn. Quiet shoes, with rubber heels, are essential. Care should be taken in the choice of the shoes, since discomfort after hours of standing will impair the efficiency of the nurse's work. In infectious cases overalls are usually worn over the uniform.

The wearing of jewellery is forbidden, as it may be detrimental to the patient's comfort.

The Nurse's Duties.—The duties of a nurse may be considered under the following headings :—

(*a*) *Duty to the Patient.*—A good, efficient and successful nurse must possess the personal qualities of cheerfulness, sympathy, tireless endeavour, alertness, good temper and tact. A high *moral* of the sick-room or ward will often make just the difference in the patient's chances of recovery in a stiff fight against injury or disease. No matter how worried and anxious she may be in nursing the case, the nurse must never show by any word or look that the patient is losing ground and that there is a chance of defeat. Again and again an apparently dying patient has recovered because of the hope and encouragement inspired by the nurse.

It should be remembered that in illness the disposition of the patient is apt to alter, demanding the exhibition of great forbearance and tact on the part of the nurse. A well-trained nurse is ever alert, and all her patient's wants are anticipated. A professional attitude, without familiarity, should

be maintained in her relations with the patient, but the nurse must remember that the patient is, after all, human and will respond to the interest and sympathy that she shows. Courtesy and kindness should always be shown to the patient's friends, and care taken to see that the visits of friends or relatives do not worry or tire him.

(*b*) *Duty to the Medical Officer.*—The nurse's duty to the doctor in charge of the patient consists in promptly and obediently carrying out all orders given. She will constantly watch for any change in the patient's condition and immediately report the onset of any unfavourable symptoms.

The secret of success in bringing about the recovery of the sick depends on good team work. In many conditions of illness more depends on good nursing than on any other factor.

(*c*) *The Nurse's Duties to Herself.*—Since so much depends on the maintenance of cheerfulness and general fitness on the part of the nurse, she must seize every legitimate opportunity that occurs of obtaining bodily and mental relaxation. The doctor only sees his patients for a few minutes, but the nurse remains for many hours in contact with suffering and pain. It is therefore essential that, whenever possible, exercise be taken daily in the fresh air. At least seven hours' sleep is necessary in the twenty-four hours. Attention must be given to the simple rules of diet and hygiene in order to maintain her health. If symptoms of illness arise, such as sore throat, temperature, septic finger, etc., they must be reported at once.

A sick nurse is not only incurring grave risks to herself, but is a danger to her patients.

Visitors to the Sick-room.—When a patient is suffering from an infectious disease that is readily communicable, all visitors must be forbidden entrance to the sick-room or ward ; but when an illness is not infectious, or when relations wish to see the patient after a serious surgical operation, or when

the patient is very seriously ill from any cause, the nurse may have a trying and annoying time with relatives. She must then fall back upon instructions from the doctor to guard the patient from visits which are as often as not inspired by mere inquisitiveness. When a fatal issue seems probable, the relatives ought, of course, to be sent for, and in the absence of the doctor the nurse may have to decide and act upon her own initiative. If a patient is seriously ill, the nurse should not leave the room when visitors are present. Moreover, she must watch that her visitors give nothing to the patient, and slip no food, sweetmeat, or fruit beneath his pillow. The hint " Nurse, you may leave the room," should be tactfully evaded if the patient is seriously ill, or during convalescence in typhoid fever. Of course, much depends upon who the visitor is, but few relatives are proof against the fervent appeals which patients are apt to make for this or that form of something to eat. A visitor should be given a chair to sit upon, placed in such a position that the patient and the visitor can see each other. If no chair is provided, the visitor may want to sit on the bed, or stand at the end of it and " drum " with his fingers on the metal at the foot of it. Again, a visitor may be ill-advised enough to stand over the patient, having no time to sit down owing to " an engagement that can't be put off," etc. The patient thereby becomes flustered and excited, and the visit does harm instead of good. Visitors usually bring flowers for the patient; this is a harmless proceeding provided the flowers have not too " heavy " an odour, and that they are removed from the room at night. The visitor also may be allowed to bring a bottle of scent of a kind desired by the patient, or such fruit as may be permitted; at times also beef tea, chicken tea, etc., may be accepted as well as beef or chicken preparations of a reliable brand.

CHAPTER II

CHOICE OF THE SICK-ROOM—VENTILATION, ETC.

When a person falls ill in a private house, the room selected for his accommodation should possess certain qualities, which are necessary if the patient is to be given the best chance of recovery.

1. **Aspect.**—The room selected should have a southerly aspect, so that the air entering by the window may possess the advantage of being sun-penetrated. A room with a northerly aspect not only lacks the cheerfulness sunshine brings, but the air entering by the window is destitute of the salubrious properties belonging to sun-penetrated air.

The scientific reason for the beneficial effect of sunlight, so long known to our forefathers, is now understood. In the first place the sunlight kills the germs of disease, and secondly, when allowed to act on the patient's skin the ultra-violet and other rays produce certain powerful beneficial effects. In addition to this general stimulating effect, which may, or may not cause pigmentation of the skin, these rays aid the vitamin action of the body, to which reference will be made later.

2. **Position.**—The sick-room should be in such a position that the patient is segregated as much as possible from the other occupants of the house. In cases of infectious disease this is imperative, but in any ailment, rest and quietness should be obtained by placing the patient in a room as far removed as possible from the noises and activities incidental to every dwelling, whether within the house or without, as in the street. In an ordinary house the top floor affords the best chance of these requirements being complied with, and in a flat, the room

farthest away from the front door should be chosen for the same reason.

In very hot weather, especially if no attic intervenes, the temperature of the top floor may be unbearable, and the patient must be removed to a cooler room on a floor below. On the other hand, in cold weather it may be impossible to keep a room sufficiently warm when the ceiling is formed by the roof of the house. Bathroom and lavatory requirements must also be taken into consideration.

3. **Fireplace.**—Undoubtedly the fireplace affords the best method of both warming and ventilating the sick-room. The cheerful effect of a blazing fire is undeniable. However, other methods of warming have now to be taken into consideration. Radiators, heated from a central supply, are in general use in Institutions. The modern gas fire is quite safe, provided that the waste gases are well conducted up the chimney. A bowl of water placed in front of the fire prevents the air from becoming unduly dry. Electric heating is convenient and no longer too expensive for general use. Under Active Service conditions, excellent results are obtained from the use of paraffin stoves. Several excellent types, such as the " Perfection," are on the market.

It is essential for both warmth and ventilation that the sick-room have a suitable fireplace, and that the chimney be clear of soot.

4. **Window.**—It is necessary that windows open readily both top and bottom ; the sash lines should be inspected as to their soundness ; and it should be seen, too, that the blind cords and fixings work smoothly. There is no objection to casement windows.

5. **Size.**—A sleeping-room, whether for the healthy or for the sick, must be of a size sufficient to allow of free ventilation without draught. A draught or swift current of air when it passes over the body carries off the heat so rapidly that the body temperature is quickly lowered, and a chill or cold is

occasioned. The loss of heat is greatest when the surface of the body is bathed in perspiration, as the evaporation of moisture from the skin further hastens the reduction of temperature. It is evident, therefore, that the circulation of air in a room must be tempered to the extent the body can tolerate, without the temperature being unduly lowered.

A person in bed, whether healthy or sick, should never be subjected to a current of air travelling at a rate greater than three miles an hour. The practical interpretation of this fact will be best illustrated as follows: It is found by scientific experiment that 1,000 cubic ft. is the smallest amount of air space which a person in a sleeping apartment should be allowed, if health is to be preserved or recovery from illness is to be favoured. A room containing 1,000 cubic ft. is one which may conveniently be represented by assuming its breadth, length and height to be 10 ft. Thus $10 \times 10 \times 10 = 1{,}000$ cubic ft. of air. Now, it has been proved that 1,000 cubic ft. of air is used up in twenty minutes by a person placed in a chamber in which there is neither entrance nor exit of air. After twenty minutes the air becomes polluted, and on its being re-breathed the deleterious products accumulated in the air of the room, owing to respiration and to emanations from the skin, are taken into the lungs, with detrimental consequences. Given, therefore, a room of 1,000 cubic ft., it is plain that as this quantity lasts only twenty minutes, and as there are three times twenty minutes in the hour, the air must be changed three times in the hour; or, in other words, 3,000 cubic ft. of air must be supplied per hour. This can be done without causing a draught. Should, however, the size of the room be below the standard given, the danger of draught is ever present. Supposing the room to contain only 500 cubic ft. of air, the air would be required to be changed six times in the hour—a rate of ventilation wholly inadmissible.

Whether in a private room or in a hospital ward,

1,000 cubic ft. must be allowed to each person; this can be carried out with mathematical precision in a large ward; but in a private room in sickness, it will be found that a larger room will be convenient and necessary, seeing that a nurse when present consumes a quantity of the available air. It is, therefore, well to have a room of an air capacity of about 2,000 cubic ft., so that the patient may have a sufficiency of fresh air; this is represented by a room of the following dimensions, viz. 16 ft. (length) × 12 ft. (breadth) × 10 ft. (height) = 1,920 cubic ft.—the size of an ordinary bedroom.

Ventilation.—The impurities added to the air in a living room are:—

1. *Carbonic Acid Gas.*—The breath escaping from the lungs during respiration is charged with carbonic acid gas, the excess of which in the air renders the room "close." Accumulation of this gas in the air of a bedroom may produce prolonged drowsiness, waking from which is attended by lassitude, yawning, headache, and depressed bodily and mental functions generally.

In hospital wards its consequences are even more serious, the healing of wounds is retarded, and illnesses of all kinds are apt to be aggravated or prolonged; these grave results follow the accumulation of carbonic acid gas in conjunction with other products due to want of ventilation.

To test the "closeness" of a room it is only necessary to go into the open air for, say, ten minutes, when, on returning to the room, the indefinable but very evident sensation of "closeness" is perceptible.

2. *Organic Material.*—In the breath exhaled from the lungs and in the emanations from the skin, particles of tainted matter (germs) are constantly being given off; the presence of these materials causes the foul odour which is noticed in a room that is insufficiently ventilated, or in public buildings when a large number of persons are present.

3. *Heat.*—The heat of the body and the warmth of the breath increase the temperature of a room and render the excess of carbonic acid gas and organic material more evident and more deleterious.

4. *Moisture.*—The moisture contained in the breath adds yet another agent whereby germ life is favoured in an ill-ventilated apartment.

Principles of Ventilation.—There are certain definite principles, affecting the entrance of air to an apartment, which have to be mastered in order to understand aright the meaning of the methods of ventilation. These are:

1. The air must have an upward direction.
2. The current of air entering must be broken in its course.
3. The entering air must be warmed before reaching the occupants.

For details of ventilation the reader is referred to the B. R. C. S. Manual No. 4 (Chapter III).

Apportioning Beds in a Ward—Floor Space and Air Space.—The beds in a hospital ward are not apportioned in a haphazard fashion, but in strict accordance with its floor space and air capacity. Following the principle of allowing 100 square ft. of floor space to each bed and 1,000 cubic ft. of air, the number of beds in a ward, apartment, barn, schoolhouse, etc., is readily ascertained. Given a room measuring 60 ft. long and 25 ft. wide, by multiplying 60 × 25 a floor space of 1,500 square ft. is obtained. Allowing 100 square ft. to each bed, fifteen beds could be assigned to a room with a floor space of these dimensions. The height of a room, however, must also be taken into consideration. Suppose the room to be 10 ft. high, then 1,500 square ft. × 10 ft. (height) gives 15,000 cubic ft. of air space, or 1,000 cubic ft. for each of the fifteen beds. Great height of an apartment—that is, a height of more than 14 ft.—does not make up for diminution of floor space, for over that height the lower stratum of air is but slightly affected by the loftiness of the

room. In the modern hospital ward, beds are generally arranged so that there is a window between one patient and the next.

Open-air Treatment.—The nursing of some diseases, such as pulmonary tuberculosis, is carried out in the open air, shelter against rain and prevailing wind being afforded in a suitable hut. The patient soon becomes accustomed to the fresh air and, after a short time, no longer feels the cold, even in winter.

CHAPTER III

PREPARATION OF ROOM FOR RECEPTION OF PATIENT

In the previous chapter we have discussed the means of ventilating and warming the sick-room. In this chapter we will first discuss the preparation of the sick-room in civil nursing and later consider the construction of out-door shelters and adaptation of existing buildings, as may be required in War nursing.

In civil nursing, when time permits, the room chosen should be emptied as far as possible of everything that is not absolutely necessary. That is to say, articles of furniture such as bookshelves, boxes, chests, ornaments, etc., that have no use, but merely serve to accumulate dust or occupy air space, should be removed. Discretion must be employed, and heavy furniture which has not been moved for some time should be left alone, since the amount of dust created in its removal will do harm. It is better to leave carpets and floor covering, putting down a canvas drugget to protect them. If an infectious case is expected, pictures should be removed, since they would be damaged by subsequent disinfection.

Dusting the Room.—Should time permit, the walls should first be dusted. This is done by tying a damp chamois leather, moistened in weak lysol or cresol solution, over a broomhead and wiping the walls downwards from ceiling to floors. The work must be done deliberately and slowly, taking special care to wipe the dust from the crevices and corners, from behind the shutters, from the cornice, from below and from the top of immovable furniture, and even from the shelves of cupboards and all drawers.

The drawers of wardrobes, chests of drawers, wash-hand stands, etc., must all be taken out, each set on its side, and freely wiped with a damp cloth. The floor should be sprinkled with water or wet tea-leaves, and the dust that accumulates on the floor from the walls, etc., is gathered into a shovel which, if the room is unoccupied, may be emptied on to the dust-heap; if, however, the room is occupied, especially by an infectious case, no dust should be removed from the room, but as it is gathered from the floor into the shovel it is thrown on the fire in the same room and burnt. To take the dust from a room in which a person is suffering from infectious fever and carry it downstairs serves but to spread the infection to the other occupants of the house.

The reader will notice, when visiting wards or an operating theatre in an up-to-date hospital, that all corners have been rounded off to prevent the accumulation of dust. At the present time the importance of a clean airy room for the nursing of a serious illness, medical or surgical, is so much appreciated that, wherever possible, such a case is moved either to hospital or to a private Nursing Home.

Washing the Floor.—When a room is being prepared for the admission of a serious case of illness, the floor and skirting should be scrubbed in the usual way, and must be thoroughly dried before making up the bed. When a room is occupied the floor should never be drenched with water, but day by day wiped over with a damp cloth tied on a broom; if so desired, the cloth may be dipped in a disinfecting fluid, or the floor may be sprinkled with the disinfectant before using the broom. Where linoleum or oil-cloth covers the floor, daily polishing with some beeswax preparation should be carried out. The turpentine in the beeswax mixture is an antiseptic, and the polished floors prevent accumulation of dirt and germs.

The Fire.—The fire in a sick-room serves the

purpose of heating and ventilating the apartment, but it must not be used for cooking. The temperature of the sick-room, whatever the nature of the illness, should be maintained at not less than 55–60° Fahr., night and day, summer and winter. To estimate the temperature of the room a wall thermometer should be hung as near the patient's head as possible, for it is the temperature of the air as it enters the nostrils that is really the point to be ascertained. It is better, therefore, to hang the thermometer from the head of the bed, or to lay it on the bed by the side of the pillow, rather than on the wall adjacent. The fire is the chief means by which the foul air finds exit from a room; and in summer when the fire is not lit, some such device may be employed as putting a lighted oil lamp into the empty grate so that a hot current of air may ascend in the chimney and thereby aid in the ventilation. In hot weather, however, the window may be opened to such an extent that this expedient is seldom necessary.

The management of the fire requires careful attention; to take coals from a coal-scuttle by a shovel in the ordinary way causes a noise which if the patient is asleep may wake him, while to a nervous person, or one who is very ill, the disturbance is most irritating, even when awake. If, instead of shovelling on the coal, the pieces are taken from the coal-scuttle by the hand or by tongs, the noise is not done away with, for in the narrow confines of the coal-scuttle, when one lump of coal is removed the others may fall in with a clatter and thereby disturb the patient. A coal-scuttle, whether of wood or of metal, should have no place in a sick-room. Instead, the coal should be placed by the fireside in an open basket, first lined with canvas or brown paper, and the coal should be put on the fire with the hand; an old glove should be kept close by and the hand slipped into it when coals have to be put on. An expedient sometimes recom-

mended, of wrapping each lump of coal in a piece of paper, is useful, since each lump can be quietly put on the fire at any time without soiling the fingers. When coals are put on the fire, if it is a straight-backed grate, they should be distributed equally and in not too thick a layer on the top of the fire; if thrown upon the back of the fire only, they cause a great volume of smoke which speedily tends to foul the chimney and fill the room with smoke.

It is well known, but seldom practically considered, that when a fire burns it is the gases given off from the coal, not the coal itself, which produce the flame and heat. If therefore the gases are not consumed, the coal is largely wasted, as the unconsumed gases escape up the chimney. If, on the other hand, the gases are directed over the flame, as in a fireplace with a forward-sloping back, the gases are at once consumed, and a clear fire results, with but little deposit of soot in the chimney. Should the chimney smoke, the cause will probably be that it is foul, and although various expedients may be tried to lessen this evil in a sick-room, such as fixing a board or piece of paper across the upper part of the opening of the fireplace, it becomes necessary, sooner or later, to have the chimney swept. To have the chimney swept while the patient is in the room is not so difficult a matter if it is gone about properly. The real objection is, that the fire has to be taken off and the grate allowed to cool; this means that the temperature of the air of the room falls—it may be to a deleterious extent in cold weather. To obviate this difficulty an extra blanket or two should be put on the bed, the patient's head and shoulders covered, and a hot bottle or two placed in the bed.

Lighting the Room.—Light and shade during daylight may have to be varied according to the desire of the patient or the ailment from which he is suffering. In many nervous troubles, and in affections

of the eye, a darkened room is often required; special blinds of a dark-green or dark-blue colour may be put up, or sun-blinds may prove efficacious. It must be remembered that a darkened room does not mean a room from which the air is excluded, and the necessary means of ventilation must still be provided in every case. Venetian blinds of a green colour are useful accessories both for shading light and for ventilation; when the strips of wood of which the blind is composed are placed so that the current of air is directed upwards, the window may be opened top and bottom without danger to the patient, and with great advantage to the circulation of air in the room, at the same time that the light in the room is shaded. In no case should the patient be placed so that the light would shine straight into his face; the position of the bed should be such that either the light shines from the side or, better still, from behind the patient's head. In the last-mentioned position the patient can read in bed with greater comfort. At night, in severe illness, it is generally necessary to have a light in the room. Electric light is not conducive to sleep unless shaded to such a degree that the reflection is directed downwards in some part of the room where the patient cannot see it. Gas light has the advantage that it can be turned low without being extinguished. An oil lamp cannot be turned down low owing to the fact that the fumes of partly consumed oil are not only disagreeable but unwholesome. A candle light can also be easily shaded, but what is termed the night-light is the one in general use. This is usually placed in a basin or saucer with water around it, but as the light is reflected on the ceiling, even when covered by a "fairy" shade, this is apt to catch the patient's eye, and may prevent sleep. The night-light should therefore be so placed that its reflection strikes a part of the room away from the direct vision of the patient, or otherwise protected by improvised shades.

There is no doubt that for hygienic purposes the electric light is the best, as it gives off no fumes to pollute the air of the room ; while gas, oil lamps, and candles not only consume the oxygen, but all add products of combustion of a deleterious nature to the air.

Construction of Out-door Shelters.—When Active Service conditions demand the provision of hospital accommodation in country devoid of buildings, excellent accommodation can be provided for sick and wounded by the erection of hospital marquees. Bell-tents are unsuitable, since it is not possible to attend to the needs of sick persons in the small space provided.

Hospital marquees are usually arranged so that five or six are laced together to make a ward long enough to contain about thirty beds.

Adaptation of Existing Buildings.—Buildings such as schools, convents, large houses and hotels readily lend themselves to conversion into hospitals.

Commandants and personnel of V.A.D. detachments should be given the opportunity from time to time of taking over such a building and practising laying out a hospital.

In addition to the wards, operating theatre, etc., the importance of a central office, Quartermaster's department, kitchen, baths, mortuary and sanitary department, must not be overlooked.

CHAPTER IV

BEDS AND BEDDING

THE hospital bed is generally of the Lawson-Tait pattern—an iron bedstead, with a wire mattress. It is about 6 ft. 6 in. long, and 3 ft. wide, and of such a height as to allow the nurse to attend to and move the patient conveniently.

The mattress is usually of hair or wool, or a mixture of these. The tick should be covered with a loose cover of unbleached cotton, which can be washed from time to time. Over the mattress a full-size waterproof sheet should be placed, immediately under the sheet (Fig. 4, p. 27). This under-sheet is to be tucked firmly beneath the mattress all round so that it is kept quite taut.

Keeping the under-sheet taut is one of the most important of the nurse's duties, for reasons which will be explained in the next chapter. The rest of the bed is completed by an upper sheet and blankets, according to the season of the year. For a bed cover a quilt or counterpane is commonly used. "Ventilated" eiderdown quilts may be permissible in private nursing.

If stretchers only are available in emergency wards, it must be remembered that the patient's back must be well protected against the cold. Straw may be placed under the stretcher to prevent circulation of air, or newspapers, sandbags, etc., may be placed under the bottom blanket.

For the best method of arranging blankets on a stretcher, the reader is referred to B. R. C. S. Manual No. 1 (p. 263, and Fig. 179). A couple of pillows are preferable to a bolster and a pillow; they should

each be covered with a cotton or linen pillow case. In a ward, care should be taken to arrange the bed-clothes according to the same pattern. The open side of the pillows, for instance, is usually arranged to face away from the door. A screen should be available so that undue draught may be guarded against. In a big ward, screens are placed round the bed when special nursing duties are being carried out, or if the patient is gravely ill or dying.

Fig. 1.—Fracture Bed.

Position of the Bed.—In a room adapted as a sick-room there will not usually be much choice of position of the bed. Where space permits the bed should be so placed as to avoid draughts, to allow the chief light to come from behind the patient's head, to afford easy access by the nurse and proximity to the heating apparatus of the room. It is important that a ready approach is possible to both

sides of the bed. In tents or improvised hospitals the beds are arranged in rows with the heads of the patients to the walls and the feet to the gangway

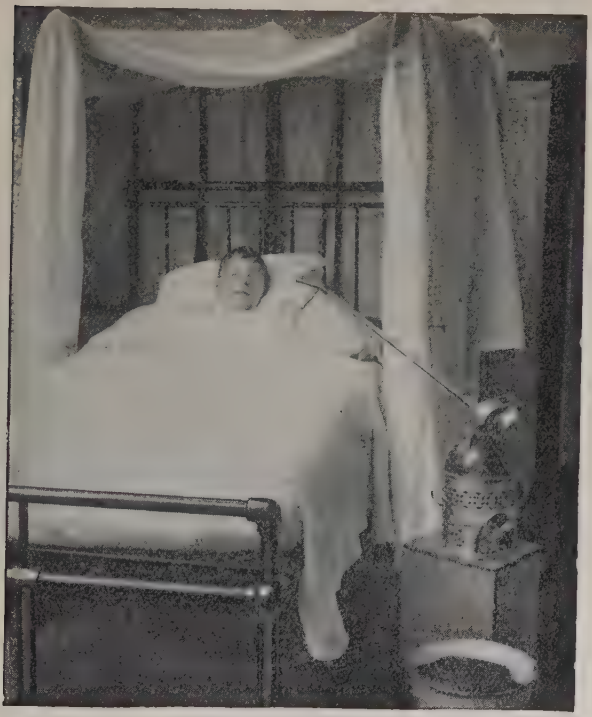


Fig. 2.—Steam Tent.

Occasionally, as in nursing cases of mustard gas, where the eyes are requiring constant attention, the head of the patient may be placed at the gangway end of the bed.

Special Beds.—(*a*) A *fracture bed* (Fig. 1) is made in the ordinary way, but with wooden boards placed below the mattress to prevent the bed from yielding. (*b*) A *bed for cases of acute rheumatism or nephritis* differs from the ordinary bed in being made up with an under-blanket and a top blanket, between which the patient lies. Sweating in these cases is so profuse that blankets are required to absorb the moisture, and so prevent chill. (*c*) A *tent-bed* or *steam tent* (Fig. 2) is used in diseases of the respiratory

Fig. 3.—Half-water Bed.

tract, especially in children. A ward screen is employed, and a canopy formed by sheets, or a special cover, leaving an opening in front of the patient. (*d*) *Operation bed.*—During the patient's absence in the theatre the bed is made in the usual way as far as the draw-sheet, but minus bolster or pillow. Three or four hot-water bottles are placed on it, and a blanket, folded, put over them. The upper-sheet, blankets and counterpane are put on,

tucked in on the one side, and folded back from the other side. Two or more pillows should be placed on the chair by the bedside—one for the patient's head when he recovers consciousness, and the other to put below the knees to relax the abdominal muscles, if required. Care must be taken to see that the hot-water bottles do not burn the patient. They must always be covered, and in hospital, where a good supply of hot water is available, should only be filled from the tap. (*e*) *Water-beds* and *air-beds* are used in cases of long, wasting illnesses (paralysis, etc.), as preventives to the formation of bedsores (Fig. 3). The air-bed is preferable to the water-bed ; it is lighter to handle, easier to fill, and does not require constant attention to keep warm. (*f*) *The Fowler position.*—The patient is kept well propped up in bed with his shoulders and chest raised on pillows or bed-rest. In order to keep him from slipping down the bed, a bolster is placed beneath his knees ; it must be firmly secured. In this position the pelvis becomes the dependent part of the abdominal cavity, so that in cases of peritonitis the diaphragm remains free from fluid, the patient can breathe more easily. and drainage from the pelvis can be carried out surgically.

A milder type of Fowler position can be secured by placing the head end of the bed on 18 in. blocks.

CHAPTER V

DETAILS OF NURSING

Washing the Patient.—It is essential that the patient be washed at least once a day, not only for the sake of cleanliness, but also on account of the beneficial effects produced by removing dried perspiration from the skin, and thereby allowing deleterious products to escape freely, as well as because of its bearing upon the temperature of the body in fever. Although in hospital practice it may be more convenient to wash the patient early in the day, it is often better to do the main bathing in the evening. The patient is not disturbed too early, and bathing in the evening has the additional advantage of helping to induce a good night's sleep.

Everything that is necessary for the bed-bath should be got ready before commencing. The windows are closed, and screens put round the bed. On the locker is placed a basin of hot water. The temperature of the water should be 110° F., as it cools quickly. The articles required are—soap, flannel, towel, spirit and dusting powder, a clean gown, long mackintosh, two bath blankets, hairbrush and comb, and shoulder cape. After the bath a toothbrush is used.

To Wash a Patient in Bed.—The bed-clothes having been turned back, the under bath-blanket is laid on the under-sheet. The patient is covered with the second bath-blanket, and the upper bed-clothes are removed. The clothing is next removed, care being taken to keep the patient covered as much as possible. The parts of the body are now washed in the following order. In dirty cases the water may have to be changed several times.

The Head and Neck.—Over the pillow a towel is spread folded double, and the face, ears and neck are washed, either with or without soap, according to the patient's preference. Care must be taken not to introduce soap into the ear passages, since harm might result. The hair, if cut short, may also be washed, if not daily, at least two or three times a week ; this is best done with soft soap in a bag of muslin, wetted and rubbed on the hair. Particular care must be taken that the hair is thoroughly dried, and it is safer if a dry towel is wrapped round the head for a short time. In all cases of prolonged illness the hair, unless it has been cut short, should be thoroughly brushed at least once a day. The beard and moustache must be washed with soap and water, combed and brushed.

The Limbs.—The rule is to wash only one limb at a time, by bringing it from below the blanket, whilst the rest of the body is carefully covered up, and in this way catching a chill is avoided. First wash the right upper limb, bared to the shoulder, and having spread a dry towel underneath, so as to prevent the bed from getting wet. After the limb has been washed, dry and cover again with the blanket. The lower extremity on the same side is then bared as far as the groin, and the bed-clothes are tucked well in round the upper part of the limb so as to prevent the cold air from reaching the body ; a towel is now spread as before below the limb, and it is washed and dried. Particular care must be taken to dry the feet well, especially between the toes. The nurse now moves to the other side of the bed, and proceeds to wash the limbs of the other side. It may be necessary to pare the nails, and it must be remembered that the nails of the toes should be cut square across, and not rounded, as in the case of the finger-nails.

Where possible two nurses should take part in giving the blanket bath. The patient can be moved

about more satisfactorily, and the limbs can be dealt with simultaneously.

The Body.—To wash the front of the body the nurse may stand on either side of the bed; she bares the chest from the neck to the groin, covers the neck and the upper part of the chest, so as to avoid chill. The front and sides of the body are then washed and dried as usual. To wash the back the patient is rolled on one side, and the back exposed, whilst the limbs and the front of the body are carefully covered with the bed-clothes. Lastly the genitals and folds of the groin should be washed carefully under cover. Most patients can do this for themselves, but in the helpless the nurse must not omit this important detail.

The washing process, as outlined above, should always be carried out in a systematic manner. Particular attention must be paid to such parts as the ears, eyes, nostrils, groins, knees, armpits and navel. In stout women care must be bestowed upon the skin under the breasts, which is apt to become rubbed in conditions where sweating is profuse.

As soon as the bath is finished, the patient is made comfortable in the bed and a hot-water bottle given him, if necessary.

After drying, the use of a little dusting powder is comforting and beneficial.

Bedsores.—Great care must be taken to prevent bedsores. With very few exceptions they are due to lack of attention on the part of the nurse. It may be truly said that the more skilful and conscientious the nurse is, the rarer will be the occurrence of bedsores. Bedsores have a tendency to form on those parts in which the circulation is feeble. The skin first becomes red and dusky, the surface blisters and becomes broken. Germs now enter from the surface, causing inflammation, and finally an ulcer forms with dead tissue in the centre (slough). (For details of the structure of the skin the reader

is referred to B. R. C. S. Manual No. 4, p. 147.) The common causes of bedsores are :—

(*a*) *Pressure.*—As a helpless patient lies on his back in bed, the skin over the lowest part of the back (sacrum), the heels, hips, shoulders and back of the head, is liable to be devitalized by the continuous pressure. The blood supply is poor in these parts, and is further interfered with by the pressure of the body.

(*b*) *Friction.*—Constant friction, as by rucks in the under-sheet or blanket, so irritates the skin that it becomes inflamed and a bedsore results.

(*c*) *Lowered Vitality of the Tissues.*—The low condition of the patient as the result of a long illness not only produces a feeble circulation but also reduces the patient's resistance to germs. A slight blister, therefore, if left unnoticed, may result in a serious bedsore under such conditions. In this group must be included cases of paralysis, where, in addition to an enfeebled condition of the tissues in the part affected, incontinence of urine and fæces may be present. Here, various contrivances for collecting urine and keeping the patient as dry as possible, such as by the use of bags filled with small pieces of marine sponge, must be employed.

(*d*) *Injury to the Part.*—Careless handling of the patient, burns from a hot-water bottle, or injury from the use of the bed-pan, may start a bedsore.

Treatment.—Prevention is the only treatment that should ever be necessary.

From the foregoing remarks it will be seen that (1) the circulation of pressure points must be maintained to the utmost. This is done by frequent changes of posture, by the use of an air-ring or water-bed (Fig. 3). Adequate cleansing of the skin will remove septic material and diminish the number of germs present. Gentle friction will improve the circulation. For this reason the usual rubbing with spirit or, better, a mixture of oil and spirit, is beneficial. Free application of powder after such

treatment is comforting to the patient, and is useful in preventing friction between the skin and the bed-clothes.

If bedsores have formed, the part must be kept as free from pressure as possible by the use of a water-bed, air-ring, or ring for the heel, etc. An antiseptic dressing will be ordered by the medical officer, gauze soaked in eusol being particularly useful.

Changing the Night-clothes.—The best time to put on a clean night-dress or pyjamas is after washing the patient. The garments should be dried at the fire immediately before being put on, for if put on as they come from the wash, or even after being " aired " and stored in wardrobes or drawers, they are always damp and dangerous.

After bathing the patient a fresh night-dress should be put on. If the patient is helpless, a split-back shirt or pyjama jacket turned front to back is advisable. A little practice will soon enable the nurse to effect this change of clothing without disturbing the patient too much. It is advisable where possible to change the night-dress night and morning, taking care thoroughly to " air " and warm them before putting them on.

Bed-making.—The bed must be made at least once a day, and twice or oftener if circumstances permit. The following articles are required to make up a sick-bed : Bedstead, mattress, two or more pillows, two sheets, draw-sheet, pillow-slips, blankets, quilt and mackintosh sheet.

Two nurses are necessary for the operation of bed-making. The bed-clothes should be taken off singly, folded, and placed on a chair at the foot of the bed. If the patient is able to get out of bed, see that he is covered with a blanket, and given a hot-water bottle if necessary. The under-sheet is smoothed over the mackintosh and tightly tucked in round the mattress to keep it taut. The top end will be turned over the bolster, if this is used.

The rest of the bed is made in the ordinary way. After the patient has been put back to bed, care will be taken to see that the bed-clothes are not tucked in too tightly to prevent his turning over. Care must also be taken to see that the bed-clothes are loose over his feet, otherwise discomfort or even "foot-drop" may result.

Changing the Under-sheet.—If the patient is too ill to leave his bed the under-sheet is changed as follows (Fig. 4) :—The patient is covered with

Fig. 4.—Changing Under-sheet.

a loose blanket and rolled over on his side to the far side of the bed. He is held in this position by the first nurse while the soiled sheet is rolled lengthwise up to the patient by the second nurse. The mackintosh will be seen exposed in the figure. The second nurse then takes the rolled new sheet, tucks it in firmly, and proceeds to unroll it towards the patient. As soon as sufficient is unrolled, the patient is rolled over to the clean side of the bed and held

by the second nurse. The first nurse now completes the operation by removing the soiled sheet and unrolling and tucking in the clean one.

The Draw-sheet (Fig. 5).—A draw-sheet should be used in all cases where the patient is wholly confined to bed. It is made either of double or single cotton sheeting 2½ yards long and 1 yard wide, the sheet being rolled up and tucked in at both ends over a yard width of rubber sheeting.

Fig. 5.—The Draw-Sheet.

In order to keep the mackintosh taut, linen is stitched to the free ends to allow of the latter being tucked in under the mattress (Fig. 5). The part of the sheet that is soiled is pulled through and rolled up to one side, while the clean portion is unrolled from the other side. When the sheet has been thus adjusted it is pulled taut, and both rolls are tucked in on their respective sides of the mattress. The draw-sheet should be placed so that the folded edge

is towards the patient's head and the two free edges lie towards his feet.

Care of the Mouth.—In sickness, as in health, it is important that the mouth be kept clean. If the patient is able to do so, it is more satisfactory to let him have a tooth-brush and powder, and to use them himself. In helpless cases, when septic matter collects on the teeth (sordes) the nurse must provide herself with several pieces of wool or lint dipped in warm lotion and held in forceps, and gently rub the teeth until clean. The tongue, cheeks, and roof of the mouth are cleansed in the same way. All false teeth are removed, and the mouth should be cleansed every four hours. For cleaning out the mouth, lemon juice, listerine, soda-water and Condy's fluid are useful. A dry, coated tongue may be cleaned by giving the patient dry toast to chew, but do not allow him to swallow it.

Care of the Hair.—The hair should be washed and rubbed till dry, then brushed and, in the case of some women patients, divided down the middle and plaited. If the head is dirty, i.e. if it contains lice and nits (pediculi), it is advisable to comb the head with a fine-tooth comb after washing. This is dipped into a solution of carbolic lotion and methylated spirit each time it is taken through the hair, and wiped on a piece of old wool.

The Bed-pan (Fig. 6).—Screens will always be placed round the bed to ensure privacy. In cold weather, warm the bed-pan, taking care that it is not overheated. Always carry the bed-pan or urinal to and from the bedside covered with a clean cloth.

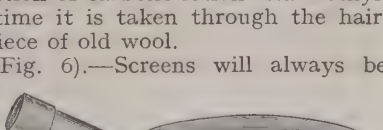


Fig. 6.—Bed-pan.

As a rule the patient should not be allowed to insert or remove the bed-pan himself. After use it

should be removed immediately. Unless the Medical Officer wishes to see the result, the pan should be emptied and flushed out immediately.

To place the bed-pan in position after abdominal operations or critical cases, two nurses are necessary. One lifts the patient, the other helps with her left hand and puts the pan in position with her right. After the action is complete the patient must be attended to by the nurse. Toilet paper may be used, or wool moistened with warm water or weak lysol solution.

The "slipper" or "perfection" type of pan is useful. Here the opening is large and its shape obviates pressure on the sacrum.

Urinals are made of glass or metal, and may be readily improvised from such articles as jam-pots.

Recently a rubber bed-pan has been introduced for use in special cases.

General Notes on Nursing

Observation of the Patient.—A nurse is never asked to diagnose disease, but she can be of great assistance to the doctor by reporting her observations of the condition of the patient, especially noting any changes that may occur.

(*a*) *General Aspect of the Patient.*—She should notice the expression of the patient's face. He may show a flushed face, indicating a rise of temperature; sudden pallor may occur, pointing to shock or hæmorrhage. He may become blue and breathe with difficulty in acute bronchitis, etc. Jaundice often shows first by the yellowness of the eyes.

(*b*) *Position in Bed.*—A person gravely ill sinks into the bed. In delirium he is restless, and may pick at the bed-clothes. In acute abdominal conditions he lies with his knees drawn up. He cannot lie down in bed in acute chest conditions. In asthma and bronchitis and heart disease he has to be propped up to get his breath.

(*c*) The *tongue*, in fevers, becomes furred and dry, moistening and cleaning as the patient's condition improves.

(*d*) The *voice* becomes weak and feeble when the patient is sinking, and is often a very useful guide to his general condition.

(*e*) *Pulse, Temperature, and Respiration.*—These points will be dealt with in subsequent chapters.

(*f*) *The Excreta.*—The nurse must always know when the patient's bowels were open last and be able to report on the nature of the action. The urine will be measured in certain diseases. Fifty ounces is the normal quantity to expect in twenty-four hours. The tests for sugar and albumin, pointing respectively to diabetes and Bright's disease, will only be carried out by the M.O. or Sister.

CHAPTER VI

FEEDING THE PATIENT

THE diet of the patient is the business of the doctor in charge of the case. The nurse's duty is to see that his instructions are carried out in regard to the kind, the amount, the quality of the food, and the times at which it should be given; she should be acquainted with the art of giving food in a manner suitable to the state of the patient. A chart of the diet should be in possession of the nurse, and on the chart the amount of food to be given at one time and the exact hours at which the food is to be administered should be specified.

No department of nursing requires more acumen on the part of the nurse than that of feeding. In many illnesses the sameness of the diet is a great stumbling-block, and the cravings of the patient must be withstood with firmness but without aggressiveness. He must be humoured, but neither pampered nor yielded to in matters which are vital; in fact, the nurse's resourcefulness and tactfulness are called upon in a superlative degree in the management of the patient as regards feeding. In no illness is the capacity of the nurse better tested than in a case of typhoid fever; this disease has, indeed, been called "the nurse's fever," from the fact that the welfare of the patient is so largely a question of nursing, of which feeding is the most important item. It may be well, therefore, to take a concrete example of feeding as illustrated in the case of a typhoid fever patient. Owing to the nature of the illness (*see* p. 113) it is essential that a diet yielding little refuse or waste material be given. Milk and beef tea are usually the articles of diet chosen. As a rule, three pints of milk and a pint of beef tea are given during the twenty-four

hours in a case of typhoid following a usual course. It is a good rule that all liquid foods given to a typhoid patient be strained. Food is administered as a general rule every two hours.

The actual quantity and the hours of feeding are decided by the doctor, who writes out definite instructions to guide the nurse.

The quantity of milk given at a time is usually 6 to 8 oz., whilst beef tea is administered in quantities of 5 oz. Twice milk to once beef tea is the usual proportion.

A diet chart in typhoid fever is, as a rule, of the following type :—

8 *a.m.*	.. .. ..	6 to 8 oz.	of milk.
10 *a.m.*	.. .. ..	6 to 8 „	„
12 *noon*	.. .. ..	5 „	beef tea.
2 *p.m.*	.. .. ..	6 to 8 „	milk.
4 *p.m.*	.. .. ..	6 to 8 „	„
6 *p.m.*	.. .. ..	5 „	beef tea.

These are the times and quantities for twelve hours during the day; for the night the same chart holds good.

The milk and beef tea should be given from a glass, cup or spoon, in preference to a feeding-cup. At times a feeding-cup is essential, but to drink from the spout of any vessel is not a natural method of taking fluid, and it is difficult to keep the spout clean (Fig. 7). A feeding-cup should therefore be reserved for special occasions, and the more natural method of taking food adhered to as long as possible.

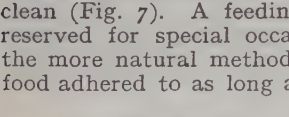


Fig. 7.—Feeding-cup.

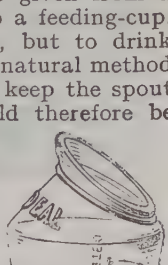


Fig. 8.—The "Ideal" drinking-cup.

In the lying-down position, to drink milk from a cup or tumbler is awkward, inasmuch as the fluid

is apt to run down the sides of the patient's mouth and wet the neck and the bed-clothes and, worst of all, the beard. A satisfactory cup to drink from has been prepared in the form of what is called the "Ideal" drinking-cup; the lip of the vessel is narrowed to a point at one side, so that the fluid is directed as a narrow stream into the mouth, instead of being spread out, as in the case of an ordinary cup or tumbler (Fig. 8). Under difficult

Fig. 9.—Giving a liquid feed.

Active Service conditions excellent feeding-cups have been improvised from cigarette tins, etc. For milk and its preparation, *see* p. 37.

To Give a Liquid Feed.—A helpless patient will be fed as shown in Fig. 9; either a feeding-cup or a spoon being used. The feed is prepared and placed on the locker at the right-hand side of the bed. A towel or serviette is placed under the patient's chin. The nurse passes her left hand and forearm

behind his pillow, thereby raising his head sufficiently to allow of his swallowing easily. She then gives the feed as shown. A short length of rubber tubing may conveniently be placed on the spout of the cup to allow the fluid to pass more easily to the back of the mouth. When the feed is over, the mouth should be carefully cleansed and the lips gently wiped.

Hospital Diets.—In hospitals the main diets usually recognized are :—

(*a*) *Liquid Diet.*—Three pints at least of milk are necessary in the twenty-four hours to maintain the patient's condition. Flavoured feeds may be given as described in Chapter VII.

(*b*) To a prescribed quantity of milk are added semi-solids such as custard, junket, thin bread-and-butter, bread-and-milk, and lightly boiled eggs.

(*c*) *Fish Diet.*—Fish, chicken, milk puddings, baked apple, etc., are allowed.

(*d*) *Full Diet.*—Meat, vegetables, puddings, bread and fruit, etc.

The nurse should remember that psychology plays an important part in digestion. In illness the gastric juice is diminished in secretion. The sight of appetizing food, skilfully prepared and daintily served, will greatly help the jaded and fitful appetite of the invalid.

***Artificial Feeding.**—Artificial feeding may be administered as follows :—

(1) By mouth ; spoon, suction or tube (Œsophageal Feeding).
(2) By the nose (Nasal Feeding).
(3) Artificial openings (Gastrostomy, Jejunostomy).
(4) By the rectum (Enemata and Suppositories).

General Rules for Artificial Feeding.—Raise the temperature of the food to be given to 99 or 100° F.

The feed is carefully measured and given at regular hours.

The necessary apparatus, together with all that is required, should be previously prepared on a tray, and covered with a towel.

(*a*) *By the Mouth.*—Spoon feeding is undertaken when the patient is unable to feed himself. Care must be taken that the spoon is the right size, that the food is not too hot, and that it does not run down outside the mouth.

(*b*) *Suction Feeding.*—This method chiefly applies to babies, and is the natural way, though artificial methods have to be employed, i.e. feeding-bottle.

(*c*) *Œsophageal Feeding.*—The following apparatus is required : œsophageal tube and glass funnel, which, after sterilization, is placed in warm water ; measuring jug with food, placed in a bowl of hot water ; lubricant and large mackintosh.

As a rule, the nurse, unless very experienced, will prepare the feed and the doctor will pass the tube into the stomach and himself administer the feed.

(*d*) *Nasal Feeding.*—Details are given in Chapter XIV., p. 119.

(*e*) *Feeding through Artificial Openings.*—Gastrostomy is a direct opening into the stomach through the abdomen. Jejunostomy, an opening into the jejunum through the abdomen. Œsophagostomy an opening into the œsophagus through the neck

The apparatus and method of administering the food are the same for all.

If a tube has to be introduced each time these cases are fed, aseptic precautions must be taken. If the tube is left in the orifice, the end is clamped, wrapped in cotton-wool, and pinned to the outside of the bandage. A funnel is connected to the tube, and the food is given by pouring it down the funnel. The first feed should consist of about 4 oz. of milk, and gradually increased until the patient is taking 10 to 15 oz. of milk and two eggs every four hours. In feeding it is most important to see that the wound is not interfered with.

(*f*) *Rectal Feeds.*—For details of nutrient enemata, *see* Chapter VII., p. 43. Sometimes the feed is introduced into the bowel in solid form ; this is known as feeding by "Nutrient Suppositories."

CHAPTER VII

INVALID DIET

Milk.—Cow's milk is the staple food in most cases of serious illness. Nature has here designed an ideal preparation, which contains the separate constituents of diet (fat, carbohydrate and protein) in the most suitable proportions. In some conditions, mare's milk or ass's milk may be specially ordered. Goat's milk may be met with in the country, and is said to be always free from the germs of tuberculosis.

The dangers of milk are contamination with putrefactive germs and disease organisms such as tubercle bacilli. Full details of graded milks are given in the Appendix, p. 191.

Should the milk supply be doubtful, it is wise to boil it before use. This may be done by boiling for a few minutes in a special apparatus designed for the purpose or in a vessel standing in a saucepan of boiling water. After boiling, the milk should be stored in clean vessels, carefully protected from dust and flies. Care should be taken when storing milk not to place it near strong-smelling substances, otherwise it will taste of them.

Milk should never be kept in the sick-room, and if the larder is too far away the vessel containing it may be placed on the landing outside the bedroom door, or on the window-sill.

If no fresh milk is available, as in the tropics, several excellent forms of preserved milk may be utilized. Either sweetened or unsweetened condensed milk or one of the many powdered forms may be selected.

Milk Recipes.—Milk may be given in the form of

curds or junket. It may also be flavoured in many different ways, and lastly is often made palatable by being made into some form of milk jelly.

(1) *Plain curds* are made from warm milk by adding a little rennet, which may be obtained in a fluid or tablet state ready for use. The whey that is left after the separation of the curd is useful as an article of diet in many illnesses, especially when milk cannot be digested or is vomited.

(2) *Egg Junket.*—One or two eggs are beaten up in a pint of milk, a tablespoonful of sugar added, and the whole then made into a junket in the ordinary way.

(3) *Milk Jellies.*—Soak half an ounce of isinglass (or gelatine) in cold water for one hour, then dissolve in the smallest quantity of hot water, make up to one pint with the flavoured milk, sweeten and allow to cool.

(4) *Custard.*—Fresh eggs and milk should always be used where possible. For further details, *see* B. R. C. S. Manual No. 5 (Cookery).

(5) *White Wine Whey.*—When a wineglassful of sherry is added to a tumblerful of boiling milk the curd that forms may be strained off; the liquid, known as white wine whey, is a good form in which to administer a mild stimulant.

(6) *To Peptonize Milk.*—Into a clean (scalded) bottle pour 1 pint of milk, ¼ pint (5 oz., or half a tumblerful) of cold water and a peptonizing powder; stand the bottle in water, as hot as the hand can bear, for twenty minutes, shaking the bottle occasionally; the milk is then ready for use. Full directions are given with every variety of peptonizing powders, tablets, or tabloids sold.

The nurse when training should frequently practise peptonizing milk. If the operation is not successfully carried out the result is unpalatable and useless.

(7) *Flavouring Agents.*—Some patients are intolerant of ordinary milk. Flavouring agents may be added in such cases, such as vanilla, coffee, tea, cocoa, etc.

In hot weather either plain or flavoured milk feeds may be made more appetizing by the addition of isinglass or gelatine.

(8) *"Typhoid bread and milk."*—Milk thickened with bread crumbs, made like bread sauce, is sometimes a useful feed.

(9) *Arrowroot* made with milk or water, and with brandy added, is useful in cases of dysentery and diarrhœa.

Invalid Meat Juices

Beef Tea.—Take 1 lb. of beef freed of fat and bone, cut into small squares, but do not mince it, and place it in an earthenware jar with a pint of cold water; secure the lid, and place the jar in a saucepan of hot water; let this stand and simmer by the side of the fire for three or four hours, strain through muslin, and squeeze out all the beef tea from the meat; add a pinch of salt to the beef tea before setting it aside to cool.

Beef tea is administered usually in teacupful doses—that is, about 5 oz. at a time.

Beef Essence.—Take a piece of lean beef, say 1 lb., freed of fat and bone, cut into small squares, and put into an earthenware jar with a couple of tablespoonfuls of cold water; put on the lid of the jar, and tie a piece of paper or cloth tightly over it; stand the jar in a hot oven and let it remain for three or four hours, or stand the jar in a saucepan half full of hot water and let it simmer for four hours. On opening the jar three or four tablespoonfuls of deep-brown fluid may be strained off through muslin. Beef essence is given to the patient when only a very small quantity of nourishment can be taken at a time. Only a teaspoonful, or at most a tablespoonful of the essence should be given at once, for it is impossible for a patient during illness to digest a large quantity of this concentrated fluid if given at one time, as kind friends often wish to be done.

Raw-meat Juice.—Half a pound of lean rump steak is finely minced and a wineglassful of cold water is poured over it; let this stand for two hours, transfer it to a cloth, and forcibly squeeze the juice from the meat. The juice should be placed on ice, but even then it will not keep longer than about twelve hours.

Raw-meat Sandwiches.—Scrape or pound in a mortar ¼ lb. of lean meat, add 1 oz. of flour or arrow-root and ½ oz. of castor sugar. Rub through a hair sieve or coarse muslin, preserving the juice; spread on bread, or bread-and-butter, adding a little salt, cover with a thin slice of bread, and cut into small 1 in. squares.

If preferred, scraped raw meat (beef or mutton) may be prepared and flavoured by the addition of red-currant jelly or celery salt.

Owing to the difficulty of ensuring the freshness and purity of the meat for making the above preparations, it is probably wiser to use one of the many beef extracts or meat juices now available on the market. These are instantly prepared and are safe from germs.

Beef Jelly.—In preparing ordinary beef tea, if an ounce of isinglass is added to each pint of the tea, the preparation, when allowed to cool, will jelly more readily.

Calf's-foot Jelly.—Wash clean two calf's feet, cut them up, and place them in a soup pot or saucepan with enough cold water to cover them well; bring to the boil slowly and skim at the boil, and repeat this from time to time. Continue the boiling for three or four hours until the bones are separated from the meat; strain through a hair sieve or coarse muslin, and let stand in a bowl or mould wetted with cold water. When the jelly is wanted for use it can be turned out of the bowl by standing the bowl in warm water, and then inverting the dish over the plate.

Chicken Tea or Broth.—Cut the chicken into small

pieces, breaking all the bones in several places, put into an earthenware jar with a pint of cold water and about half a teaspoonful of salt, cover the jar tightly, and stand in a saucepan half full of boiling water, let simmer for three hours, and strain. Chicken tea is usually given in teacupful (5 oz.) doses.

Chicken Jelly.—The chicken is skinned, the fat removed, and the whole chicken cut into small pieces, chopping up the bones; pour a wineglassful of water into the jar along with the chicken, fix the lid tightly, and stand the jar in a saucepan of boiling water, in the oven or by the side of the fire, to simmer for four or five hours; strain through muslin and allow to cool. A tablespoonful at a time is about all the patient can digest. Chicken jelly can be taken either as a jelly or as a fluid by warming.

Chicken Cream.—Take the breast of a chicken, cut it up fine and pound in a mortar; place this in a saucepan with a teacupful of milk, and heat, stirring all the time; a pinch of salt is added and a tablespoonful of cream; strain and serve hot. Mutton, beef, veal or fish can be made into a cream in the same way as chicken by thoroughly pounding it first and skimming off the fat.

Vegetable Creams.—Asparagus tops, spinach and potato, etc., may be made into a cream in the same way.

Invalid Drinks.

Barley Water.—After washing the barley put 2 oz. (4 tablespoonfuls) into a jug; over this pour a pint of boiling water, and strain when cold. Sugar and lemon may be added to taste, using four lumps of sugar, the rind of one lemon, and the strained juice of half a lemon. When it is desired to make the barley water thick, boil the barley in the water until this is reduced to two-thirds its original quantity. The thickened barley water is useful for diluting milk.

Toast Water.—Take two large or three small slices of stale bread and toast them before a bright fire, brown well, without burning, until they are crisp; put them into a large jug and pour over them a quart of boiling water; strain when cold, and add a lump or two of sugar and a squeeze of lemon as desired.

Lemonade.—Put the peel and the juice of a lemon with three or four lumps of sugar in a jug, pour a pint of boiling water over the ingredients, cool, and strain. In making lemon drinks, only the outer part of the rind, which is yellow, must be used, and to obtain the full benefit of the flavour the fruit should be soaked in water sufficient to cover it for twenty-four hours; to this is added the lemon juice. The juice may be squeezed out by a patent squeezer, but, if this is not at hand, the white part of the rind, after the thin yellow peel has been removed, should be scraped off by a knife, otherwise, if the white part is allowed to remain, the lemonade will have a bitter taste. The lemon may be squeezed by the hand, or cut into pieces and strained through muslin.

Home-made Effervescent Lemonade.—Squeeze the juice of a lemon into a tumbler, nearly fill the tumbler with cold water, add two lumps of sugar; when the drink is given add a third of a teaspoonful of bicarbonate of soda, and let it be drunk while effervescing.

Effervescent Drinks.—Soda water and lemonade, whether from bottles or from syphons, are not suitable drinks for an invalid; they are apt to increase the thirst, and to cause indigestion and discomfort.

Orangeade.—This is made in the same way as lemonade. Two oranges will be required to make a pint of drink.

Iced Drinks.—Almost any fluid given to the patient may be iced either by being stood upon ice or by adding ice to it; but no iced fluid, nor even cold

drinks, should be drunk, but sipped from the glass or taken with a spoon, or sucked through straw.

Ice may be sucked from time to time, but not *ad libitum*. If the practice of sucking ice is kept up for a long time, stomach troubles such as wind, eructations and indigestion ensue.

Albumen Water.—This is often usefully given in small repeated quantities in cases of persistent vomiting. It is also part of the diet in certain cases of gastric ulcer. Take the white of a fresh egg in a tumbler, add cold boiled water till the tumbler is three parts full. Gently stir till the albumen is thoroughly mixed with the water, strain through muslin. Add a little vanilla or lemon juice as a flavouring. Using this method, the albumen water is ready for immediate use.

Tea, coffee and cocoa are useful drinks in illness. It is not necessary to describe their preparation.

Alcoholic Drinks.—No form of wine, spirits, or alcoholic beverages will be administered or allowed by the nurse unless specially ordered by the doctor or medical officer in charge.

For further information the reader should refer to the B. R. C. S. Cookery Manual, No. 5.

Nutrient Enemata.—The most important constituent of rectal feeds is the fluid. A skilful nurse will be able to introduce, and a well-trained patient to retain, 5 to 10 oz. or even more of fluid every four or six hours. At the present time ½ oz. of glucose is added to the saline solution warmed to body heat. This is introduced through a rubber catheter coated with vaseline and passed well into the rectum; to this a tube and funnel is attached. "Saline" is made by dissolving one teaspoonful of common salt in a pint of warm water. It is called "normal" since in this strength the salt is at the same percentage as in the serum of the blood.

***Vitamins.**—The accessory food factors discovered in 1912 by Professor Sir Gowland Hopkins, of Cambridge University, have now taken a recognized place

in a well ordered dietary both in health and disease. These substances are known as vitamins, and are divided into classes, A, B, C, and D. Vitamins are produced, either directly or indirectly, by the action of sunlight on plants when they are in the state of active growth. Thus the fresh grass of spring and summer contains Vitamin A, which is passed by the cow into the fat of her milk. It is for this reason that winter milk unfortunately contains relatively little Vitamin A.

Vitamin A.—This vitamin has now been shown to consist of two factors. There is first a growth-promoting factor, which possesses the most important property of stimulating the body's resistance to infection.

The second has to do with the control of bone-growth and teeth-formation.

Both these factors are present in cod-liver oil, in the fat of summer milk, in extracts of animals' liver, the yolk of eggs, etc.

The second factor in the original Vitamin A, now known as Vitamin D, can be produced artificially by the action of ultra-violet light on a substance derived from ergot of rye (ergosterol).

Vitamin B (anti-neuritic).—This vitamin is found in yeast, orange and lemon juice, whole-meal bread, and green vegetables, such as raw lettuce and properly cooked cabbage. Fowls fed on polished rice rapidly become paralysed, and rats fed on a diet of sterilized white bread and milk soon show signs of disease. In India, when natives live on polished rice, that is, rice from which the "germ" has been removed, they develop a disease with paralysis (beri-beri). In a diet deficient in Vitamin B, such as is supplied when white bread and over-cooked vegetables, with no fresh fruit, are taken, the minute nerves of the alimentary canal become affected, leading to intestinal stasis and constipation. This is cured by giving yeast or one of its extractives, whole-meal bread, etc.

It must be remembered that heating food in the presence of oxygen destroys the vitamins. In cooking green vegetables a steamer should be used, and soda (which is often added to preserve the colour) should be avoided. Further research has shown that this vitamin also contains two factors.

Vitamin C (anti-scorbutic).—This is present in orange and lemon juice, green vegetables, etc., and is necessary in order to prevent scurvy. It is important to recognize the fact that in artificial feeding of infants, when dried milk preparations are used, a little orange-juice should be added to the diet, from the anti-scorbutic point of view.

Vitamin C is rapidly destroyed by heat.

CHAPTER VIII

MEDICINES AND THEIR ADMINISTRATION

THE administration of medicine demands tact from the nurse in a high degree. From the very fact that a substance comes under the denomination of medicine, it is apt to cause remonstrance on the part of the patient. Medicines are commonly made up in the form of mixtures, pills, powders, tablets, cachets, or they consist of oils, syrups, etc.

On Active Service it is generally found possible to give in tablet form all medicines that may be required. Antiseptics and lotions will be dealt with in a subsequent chapter.

Measuring Medicines.—Medicines have to be exactly measured, not only by the apothecary who makes up the prescription, but also by the nurse or hospital orderly, who must be thoroughly acquainted with the various measurements.

The chief weights in use in medicine are the grain, the ounce, and the pound.

The *grain* (Latin *granum*) is abbreviated in a prescription to gr. Thus, three grains is written gr. iij. The *ounce* (Latin *uncia*) is indicated in a prescription by the symbol ℥. Thus, one ounce is written ℥j. The *pound* (Latin *libra*) is written lb. Thus, two pounds is written lb. ij.

The liquid measures, or measures of capacity, are the minim (drop), the fluid drachm, the fluid ounce, the pint, and the gallon.

The *minim* is the medicinal *drop*; but a drop varies in size according to the nature of the fluid; thus, a drop of water or of spirits of wine is much smaller than, say, a drop of castor or of olive oil. A "graduated" measure glass (Fig. 10) must therefore be always used when dealing with medicines

in small quantities. The fluid drachm, 60 minims, is usually regarded as a *teaspoonful*, but the domestic teaspoon varies in size to such an extent that in measuring medicines a teaspoonful should always be a "measured" or medicinal teaspoonful. The same holds good in the case of *dessertspoonfuls* and *tablespoonfuls*. These are spoken of as the equivalent of 2 drachms and 4 drachms ($\frac{1}{4}$ or $\frac{1}{2}$ ounce) respectively, but they are not to be regarded as dependable measurements, and the "measured" teaspoonful, dessertspoonful, or tablespoonful is always to be used instead.

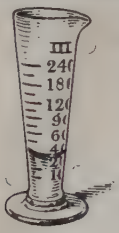


Fig. 10.—Graduated minim measure-glass, showing curved level of fluid.

The spoonfuls may be measured in a medicine glass (Fig. 11), or in a porcelain spoon marked off by lines into quantities (Fig. 12).

When measuring fluids in a graduated medicine glass, it will be seen that the surface of the fluid is not quite level but forms a curve (Fig. 10). The surface of the fluid should be held level with the eye and the reading taken from the lowest part of this curve.

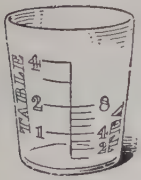


Fig. 11—Graduated medicine glass.

Fig. 12.—Graduated medicine spoon.

The medicine spoon is made to stand on a table, and possesses thereby an advantage over any of

the domestic spoons, which, when they have to be set down on the table, tilt and spill their contents.

Table of Liquid Measures

1 minim	=	1 drop (medicinal).
60 minims	=	1 drachm.
8 drachms	=	1 ounce.
20 ounces	=	1 pint.
2 pints	=	1 quart.
4 quarts	=	1 gallon.

Table of Domestic Measures

1 teaspoonful	=	1 drachm (ʒj).
1 dessertspoonful	=	2 drachms (ʒij).
1 tablespoonful	=	4 drachms = ½ ounce (ℨss).
2 tablespoonfuls	=	8 drachms = 1 ounce (ℨj).

In the half-ounce symbol, written ℨss or ℨfs, the "fs" or "ss" is contracted from *semis* = half.

The *gill* officially measures 5 oz., so that 4 gills = 1 pint; but the gill measure varies so frequently in different parts of the country that it had better be avoided for medicinal purposes.

A teacupful is frequently mentioned in cookery and in feeding patients, but teacups, of course, vary much in size. The ordinary British or Japanese teacup in everyday use contains, when filled to the brim, about 6 oz., and a breakfast cup, 9 oz. As usually filled at meals they contain about 4½ oz. and 7½ oz. respectively.

A tumblerful is approximately half a pint when the glass is filled to the brim; a sherry glass contains approximately 2½ oz., a port glass 3 oz., and a claret glass 5 oz.

The scale by which the weight of drugs is calculated officially is as follows:

1 grain		written in prescriptions gr. j;
480 grains	= 1 ounce	,, ,, ℨj;
16 ounces	= 1 pound	,, ,, lb j.

Pills, Tablets, and Cachets.—To give a *pill*, place it in the mouth on the tongue. A large mouthful of water is then taken, and as in the act of swallowing the tongue is raised from tip to root against the roof of the mouth, the water washes the pill with it to the back of the throat. *Tablets*, crushed or whole,

can be taken in the same way. Many patients imagine that they cannot swallow medicine in the form of *cachets*. A skilful nurse, however, will easily persuade the patient to swallow even the largest of cachets. The cachet ordered is placed on the tongue and a mouthful of water held while the patient counts twenty. He then takes a drink of water, with which he easily swallows the medicine.

Powders.—Powders are generally insoluble in water, and if put in the mouth dry are apt to be inhaled, causing coughing. They are best given either in a sandwich or in a teaspoonful of jam. Powders are now generally given as a cachet, except to small children.

Castor Oil.—Castor oil in small doses can be given in capsules. When ordered as a half-ounce or ounce dose it is best given as follows: A good preparation is practically tasteless, but is objectionable because the oil is sticky and hangs round the mouth; the oil should therefore be warmed. Float it on hot coffee, give the patient a slice of lemon to suck afterwards, and usually there will be no trouble.

Cod-liver Oil is readily taken by many patients, especially when given in the emulsion form. There are several flavoured preparations on the market for those who cannot take the plain oil.

Administration of Medicines.—Before giving medicine, always carefully read the directions and make quite certain of the correct dose. In hospitals this will be checked by the Sister or senior nurse in charge of the ward. In the case of liquid medicine, always shake the bottle before pouring out the dose. Mistakes occasionally arise and the patient is given a lotion or liniment, with disastrous results. Such errors should not occur, since liquids not intended for internal administration are dispensed in coloured and corrugated bottles to which a red label is affixed.

Time to Give Medicines.—Medicines are usually given twice or three times a day. Unless otherwise ordered, the dose should be administered imme-

diately after a meal. When the stomach is full less irritation is likely to be caused by the drug. When medicines are ordered the time must be written down in the report, and a note made when each dose is given.

Aperient Medicines.—Purgatives may be given in the form of pills or powders, or as fluids with the aperient salt dissolved in them. The drugs given as pills or powders are generally slowly acting medicines and are given at bed-time. The meal that immediately precedes the giving of a purgative should be a light one; thus, if a pill is to be taken at bed-time a heavy dinner should be avoided, and only the very lightest of food taken for dinner or supper. Salts, such as Epsom salts, and aperient waters, etc., are as a rule administered in the early morning, either with or without a pill given the night before. Salts are much more speedy in their action than pills or powders, and act better if a glass of hot water or a cup of tea is taken from half an hour to an hour afterwards. It is seldom advisable to give purgatives during the day, as they are apt to upset the patient by interfering with meal times, or affecting him at inconvenient times.

***Medicines Administered Hypodermically.**—Many drugs and other remedies are introduced beneath the skin with the hypodermic syringe (*see* Fig. 47, p. 137). This procedure is usually carried out by the doctor, but in urgent cases it may, under his directions, be done by a thoroughly trained nurse. Members of Voluntary Aid Detachments should know how to sterilize the syringe and needle that are to be used, how to sterilize the skin at and around the spot where the needle is to be introduced, and to have a thoroughly sterile glass or porcelain vessel in which to dissolve the hypodermic tablet. On no account is a hypodermic injection to be given by anyone except by a doctor or a trained nurse.

In addition to the introduction under the skin of certain drugs, they may be injected either into

a muscle (intramuscularly) or into a vein) intravenously). This will usually be done only by a Medical Officer.

Suppositories.—Conical-shaped preparations, an inch or two in length, and about ¼ inch in breadth at the base, containing drugs which are incorporated with cacao butter, may be introduced into the lower bowel. The suppository should be smeared with a little olive oil or vaseline before being introduced ; the conical point is held against the aperture of the bowel, when by a gentle push the whole suppository will disappear. In the bowel the suppository melts and the drugs it contains are set free and absorbed.

Ointments and Salves.—Some ointments are merely applied as remedies for skin affections, others, such as mercury (blue ointment), have to be rubbed in so that the drug may find its way through the skin, when it is absorbed into the blood and tissues.

Gargles and Sprays.—In certain cases of infection of the throat, warm antiseptic lotion has to be applied to the surface of the tonsils. This may be done by making the patient gargle. A more certain way is to apply the fluid by means of a fine spray. In some cases the lotion is best applied by means of a new Higginson's syringe. The patient holds his breath and leans forward over a basin while the nurse gently pumps, directing the stream to the back of the throat.

Inhalations (Vapours).—In cases where there is inflammation of the larynx and interior of the noses the remedy may be applied to the inflamed mucous membrane by making the patient inhale medicated steam. Special inhalers are available for this purpose, or a practical method may be improvised as follows : A pint of boiling water is placed in a tall quart jug with a towel wrapped round the upper margin so as to form a ring. The substance to be inhaled is added to the boiling water and the patient then breathes in the medicated steam through the nose and mouth.

***Oxygen.**—Under certain conditions, administration of oxygen gas is carried out, greatly to the comfort of the patient. The nurse is usually ordered to hold a funnel near the patient's face for five or ten minutes every half-hour. The gas is supplied in cylinders, and the rubber tube connected to the funnel should be long enough to pass in coils through a vessel containing hot water. Care must be taken not to turn on the tap too suddenly, or it will annoy or frighten the patient.

***Subcutaneous Infusion.**—In certain conditions, notably traumatic shock, where the quantity of circulating fluid is diminished, it becomes necessary to give fluid. If the patient is vomiting or unconscious, fluid cannot be given by mouth. Failing success in giving fluid by the rectum, as when diarrhœa is present, the only means left is to run fluid into the tissues beneath the skin. A suitable needle is pushed into the loose tissues beneath the breast or thigh. This is connected by a long rubber tube to a reservoir of hot saline (a thermos apparatus is useful), and the required quantity given.

***Intravenous Infusion.**—In certain cases it is necessary to administer fluid speedily to save life. A fine needle is pushed directly into a vein and the required amount is given, usually half to one pint. Saline, glucose saline and Bayliss's gum solution are given in this way.

***Transfusion.**—This term denotes the giving of blood intravenously. Blood is collected from a suitable "donor," prepared to prevent clotting, and then injected into the patient. One or two pints are given at a time. This is done after severe hæmorrhage, or in grave shock.

Nurses should not be allowed to offer themselves as "donors."

The two last-named methods of administering fluid will only be carried out by the doctor.

CHAPTER IX

TEMPERATURE OF THE BODY—FEVER

The temperature of the body in health follows a definite course, varying as the day advances. In the early morning, from 4 to 6 a.m., it is normally at its lowest; usually in healthy persons it is about 97·5° Fahr., that is, about a degree below the normal. As the morning advances the temperature gradually rises, until by the forenoon it reaches the normal of 98·4° Fahr. After noon and towards evening it is in healthy persons at its highest, when it may exceed the normal by a fraction. Late in the evening it declines, reaching the normal at midnight, and afterwards gradually falling until it again touches its lowest point between 4 and 6 a.m.

A low or subnormal temperature of the body is present in cases of shock due to injury or after surgical operations, of collapse from alcoholic poisoning, and of exposure to cold. In these conditions it is necessary to adopt remedial measures to prevent the fall becoming extreme. Should the thermometer indicate a temperature below 96° Fahr. the patient may collapse: should it fall to 94° Fahr. the condition becomes alarming, and if only 92° Fahr. is registered a fatal issue must be anticipated. It is a duty, therefore, after all accidents and operations, or anything that may cause severe shock, as in scalds or burns, to do everything possible to prevent the temperature from becoming extremely low. (1) Bottles containing hot water must be applied to the feet, the thighs, and the sides of the body, under the armpits or to the groins, care being taken that the bottles are carefully wrapped in thick layers of flannel to prevent injury to the skin. It has been found experimentally that the greatest amount of

heat is absorbed in parts where the large blood-vessels come to the surface. In the armpits and groins the axillary and femoral vessels pass just under the skin. Hence the reason for placing bottles in this situation. The bottles may be of india-rubber, glass, earthenware or metal, or, in the absence of any of these, hot bricks may be substituted. (2) Hot drinks, especially tea or coffee, are to be given, provided, of course, the patient is conscious. (3) The temperature of the room should be raised to about 70° Fahr. (4) The patient should be wrapped in blankets. (5) Medicinal stimulants should be left for the doctor to administer.

Increase of Temperature. Fever.—A rise in the temperature of the body is seldom absent in illnesses of any consequence. The technical term for fever and the febrile state is pyrexia ; absence of fever is termed apyrexia. When the temperature is 106° Fahr. and over, it is spoken of as hyperpyrexia.

A rise in the temperature of the body or a febrile state is met with—

(1) In all " specific " fevers, such as scarlet fever, measles, typhoid, smallpox, etc.

(2) In all inflammatory states, such as pneumonia (inflammation of the lungs), peritonitis (inflammation of the peritoneum, the lining membrane of the abdomen), synovitis (acute inflammation of a joint), and septic conditions, such as an inflamed wound, abscess, etc.

(3) Many other conditions, which need not be mentioned here.

Signs and Symptoms of Fever.—Feverishness is a well understood term. It is usually ushered in by a chill (a " rigor," or shivering fit), during which perspiration is arrested, and the skin becomes pale and cold, owing to the contraction of the blood-vessels at the surface of the body. The common symptoms of the onset of the febrile condition are loss of appetite, a coated tongue, headache, convulsions (in children), vomiting, constipation or

diarrhœa, pains in the limbs or back, sleeplessness or delirium, increased pulse- and respiration-rate. In specific fevers a rash appears on the skin. The special signs and symptoms arising in connexion with the specific fevers are described in Chapter XIV.

Clinical Thermometer.—The thermometer by which the temperature of the body is taken is termed a clinical (bedside) thermometer (Fig. 13). It differs

Fig. 13.—Clinical thermometer, indicating a temperature of 96,8° Fahr. The arrow points to normal.

from others, such as the wall and bath thermometers, inasmuch as it is self-registering, containing in its tube a small rod of mercury which does not recede into the bulb of the thermometer when removed from the body, but has to be shaken down forcibly. The clinical thermometer is scaled from 95° to 110°, and sometimes 115°, which is usually well beyond the limits of the range of temperature in disease. The figures marked on the thermometer are 95, 100, 105, 110, and it may be 115. The reason the intervening figures are not marked is that there is no room for their insertion, but strong black lines are inserted to indicate intermediate degrees. Between these, again, more minute lines are placed showing the division of a degree into its decimal parts; thus between 96 and 97 there are four black lines inserted indicating the division of the degree, as 96·2, 96·4 and 96·8; but the register may lie midway between these decimal points, so that if it registers its highest point between 96 and the first short line on the scale, which stands for 96·2, the temperature is then 96·1; and so when it stands at the interval between the lines indicating 0·2 and 0·4, the temperature is then 96·3, each degree being divided into decimals ranging from 1 to 10.

The thermometer consists of a bulb containing mercury in a well and a stem containing a fine tube

communicating with the well below, along which the mercury rises when it is heated. When cooled, the main part of the mercury recedes into the well, but a portion, the registering rod, remains in the stem and does not move from its place until it is forcibly shaken down. To shake the column of mercury down considerable practice is required, and the beginner will probably succeed in breaking several thermometers. All that is required is to grasp the top of the stem (not the bulb end) firmly and then to give a sudden flick with the wrist. The register must be looked at until the column of mercury is quite down. When in use in hospital, thermometers should be kept in a glass vessel containing weak lysol solution with a pad of wool in the bottom. Before use the lotion is rinsed off in cold water. Care must be taken to avoid the use of warm water.

To Take the Temperature.—Thermometers are usually stamped with the time required to register the temperature. It is wise, however, to leave the half-minute thermometer the full minute, and the three-minute thermometer for five minutes. The temperature should not be taken in the mouth immediately after the patient has had a hot drink. The temperature of the body may be taken in the mouth, where the bulb is placed beneath one or other side of the tongue with the lips closed ; the patient must breathe through the nose, the thermometer must not be taken from the mouth, nor must the patient speak, or breathe through the mouth, whilst the temperature is being taken. The temperature may also be taken in the armpit ; the bulb of the thermometer is placed deeply in the recess of the armpit next the skin with its stem projecting forward to the front of the axilla ; the arm is brought to the side and there held firmly whilst the thermometer is in position. In some cases the temperature is taken in the bowel (rectum), the bulb of the thermometer being pushed up into the bowel for a distance of 2 in. and held there.

In infants a convenient place to take the temperature is the groin ; the thermometer with its bulb inwards is laid flat on the skin along the groin ; the thigh is bent up on the abdomen and held there. There is but slight difference, as a rule, in whatever part the temperature is taken, whether in the mouth, the armpit or the groin, but in the bowel it is usually higher than elsewhere. The time the thermometer should be kept in place depends on the construction of the instrument.

The temperature, as a rule, is taken in the morning between 8 and 10 a.m., and again in the evening between 5 and 7 p.m. In some illnesses observations are required four-hourly or two-hourly, and in critical illnesses more frequently still. When the thermometer is removed from the patient it is washed in cold water, or a disinfectant (lysol solution), then wiped dry, and returned to its case or the vessel containing antiseptic lotion. The temperature is read and recorded in a book kept for the purpose, or on a temperature chart. The reading should be verified before the mercury is shaken down so as to be ready for the next observation. Do not shake the mercury down until the temperature is recorded and verified ; for if shaken down before the record is made, a false entry is not impossible, the observer getting confused between, say, 101·2° and 102·1°, or between 103·4° and 104·3°, and she may be tempted to register the one or other, although in doubt between them. The only way to correct this mistake, if the mercury has been shaken down, is to take the temperature again, a step which the patient may resent.

***Types of Fever.**—The recognized types of fever are three in number :—

(1) *Continued Fever.*—The temperature may continue for days, weeks, months, above the normal, and with but a slight variation in range, no more than 1½° Fahr. difference occurring between the highest and the lowest reading. The characteristic

features of continued fever are its small range, the fact that temperature does not fall to the normal, and, as a rule, its long persistence.

(2) *Remittent Fever.*—When the daily range of temperature exceeds 2° Fahr. the fever is termed remittent. Prolonged remittent fever is present in tuberculosis of the lung (phthisis, consumption) and other wasting diseases, where the range of tempera-

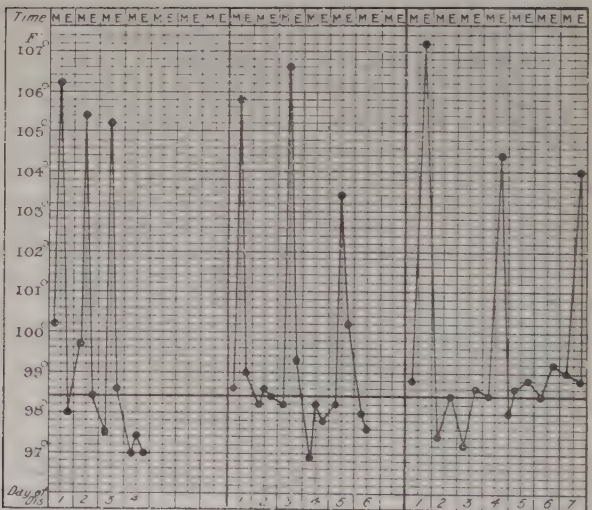


Fig. 14. — Charts of malaria fever (ague) showing different types : i. quotidian (daily) fever ; ii. tertian (every third day) fever ; iii. quartan (every fourth day) fever.

ture is considerable. Hectic fever is the term often applied to illnesses of this nature. The temperature may fall to the normal or below it.

(3) *Intermittent Fever.*—When fever is present for some hours only during the day, the fever is said

to intermit. Malaria (ague) is characterized by febrile attacks of this nature, the temperature falling to or below the normal between the attacks. (Fig. 14.)

Careful taking and recording of the temperature in disease is highly important from several points of view. Not only is the presence of fever thereby indicated, but the very nature of the ailment from which the patient is suffering may be ascertained.

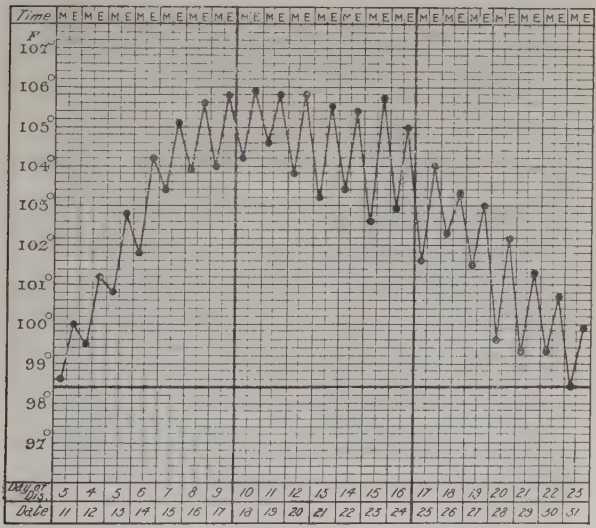
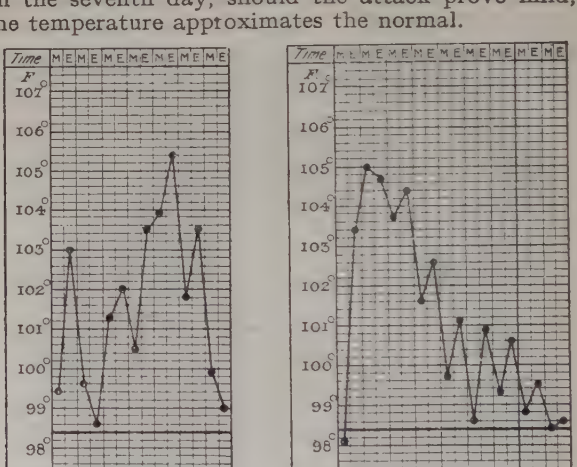


Fig. 15.—Three weeks' chart of typhoid (enteric) fever.

Most diseases have a more or less characteristic temperature.

In *typhoid fever* (Fig. 15) the temperature gradually rises, and may take a week before it reaches its highest point. It will be seen that during the first week the evening temperature is, as a rule, about two degrees above the morning temperature; on the following morning it will be found to have

dropped about one degree, to rise two degrees again in the evening, and so on until the beginning of the second week. In *measles* (Fig. 16) the temperature will be seen to rise suddenly on the first day of the illness, to drop during the second and third days, and to become high on the fourth, fifth, and sixth days; on the seventh day, should the attack prove mild, the temperature approximates the normal.



i. ii.

Fig. 16.—Chart (i) of measles, (ii) of scarlet fever.

In *scarlet fever* (Fig. 16) the temperature quickly rises to a high—it may be its highest—point and passes off gradually. In *septicæmia* (blood-poisoning) (Fig. 17) the range of temperature is very great, varying as much in the course of a day as 9° Fahr.; the rise and fall are irregular, the highest point being reached sometimes in the morning and forenoon, and

at other times towards afternoon or evening; a temperature of this nature is spoken of as "swinging." In *malaria* "periodicity" is the characteristic feature of the chart, the fever coming on daily (quotidian) about the same hour, or every other day (tertian), or every fourth day (quartan). (Fig. 14.) In *tuberculosis* (consumption) the temperature usually rises in the evening and falls in the early morning.

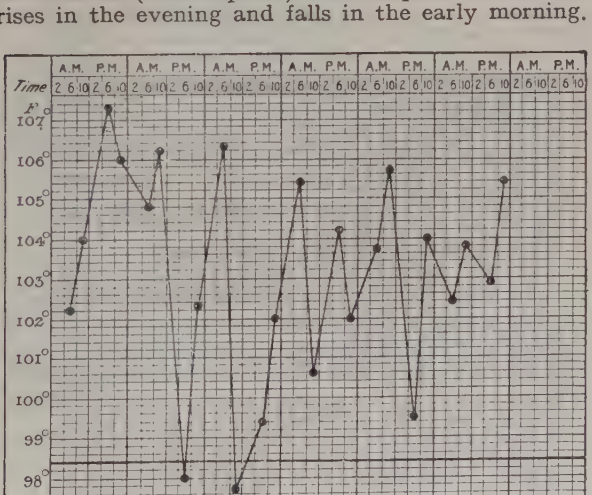


Fig. 17.—Chart of a case of septicæmia (blood poisoning).

Where an infective condition, such as tuberculosis, is present, a rise of one or two degrees may follow massage or violent exertion. In a healthy person excessive exercise in hot weather will send up the temperature several degrees.

Fall by Lysis.—When the decline in temperature is gradual, as occurs in the third and fourth weeks of typhoid fever when the disease runs a favourable course (*see* Fig. 15), the temperature is said to fall by lysis.

Fall by Crisis.—When the temperature falls suddenly, as normally occurs in cases of acute inflammation of the lungs (pneumonia) on the seventh or eighth day of the illness, or when, as in the course of typhoid fever, during the second or third week the temperature falls from, say, 105° Fahr. to 97° Fahr., or below—it may be in half an hour or less—the fall is said to be by crisis. A sudden fall by crisis in typhoid indicates either severe hæmorrhage from an ulcer in the intestine, or perforation of the bowel and the escape of the contents into the cavity of the abdomen.

In the course of an illness a sudden accession of temperature generally indicates that some complication has arisen in the shape of inflammation of some important organ. The development of pneumonia is a common occurrence in many illnesses, and a marked rise of temperature will almost certainly indicate its onset.

CHAPTER X

THE PULSE

THE pulse is due to a momentary distension of an artery with blood, caused by the contraction of the heart (left ventricle). The object of feeling the pulse is to ascertain (1) the rate or frequency at which the heart beats; (2) the regularity of the heart's contractions; and (3) the strength (or weakness) of its action.

Frequency.—In health the rate of the pulse varies according to (*a*) age, (*b*) the position of the body, (*c*) sex, (*d*) height, (*e*) exercise.

(*a*) *Age.*—In the newly-born infant the heart (and therefore the pulse) beats some 130 to 140 times a minute; by the age of six the rate has fallen to about 100; in adult years the rate averages about 72; and in old people it may be slightly slower or slightly quicker than in adult years.

(*b*) *Position.*—A healthy adult man has a pulse-rate of about 72 when sitting, of 80 when standing, and of 65 when lying down. A pulse-rate between 60 and 90 is considered to be within the range of health.

(*c*) *Sex.*—Women have, as a rule, a quicker pulse than men.

(*d*) *Height.*—A tall man has generally a slower pulse than a short man.

(*e*) Exercise quickens the pulse, the rate of increase varying with the duration and violence of the exercise.

In disease the pulse is (1) slowed in certain ailments, such as kidney affections, and in certain injuries, such as compression of the brain; (2) quickened (*a*) in all specific fevers—scarlet fever, rheumatic fever, etc.; (*b*) in all inflammatory affections,

such as pneumonia (inflammation of the lungs) and erysipelas ; and (*c*) in debility.

***Rhythm.**—The rhythm (or evenness of beat) of the pulse depends upon the rhythmic beat of the heart, a regular beat producing a regular pulse. The variations in rhythm in some cases indicate grave disease, in others may be disregarded. Accurate analysis is now carried out by records of the heart's action made by the electro-cardiograph.

To Take the Pulse.—(*a*) Stand or sit, according to the position of the patient, on the outer side of the right or left upper limb. (*b*) Place three fingers (the fore, the middle and the ring) of the right hand on the radial artery, about half an inch from the outer (radial) or thumb side of the forearm, and with the central of the three fingers one inch above the front of the wrist ; at the same time place the thumb of the hand with which the pulse is being felt behind the forearm so as to support it. If the right hand is used in taking the pulse on both the right and left sides, the forefinger will be nearer the elbow than the other fingers when the right pulse is being felt, and nearer the wrist when the pulse at the left wrist is taken. Should either hand be used in taking a pulse it is usual to feel the right pulse with the left hand and the left pulse with the right, in which case the forefinger is nearer the wrist on both sides. (*c*) Hold a watch (possessing a second-hand) in the unoccupied hand and count the rate of pulse for a full minute, noticing at the same time whether the pulse is intermittent or irregular. A trained nurse will also be able to gather information as to the hardness or softness of the pulse, and whether it is wiry, or full, or bounding, etc.

The pulse may be felt at many places besides the wrist, should occasion arise. The trunk of the temporal artery can be felt on its way to the temple and scalp as it crosses over the arch of the cheek-bone.

It is necessary to be familiar with the method of taking the pulse at the temple, as in several con-

ditions the pulse at the wrist is not available; in rheumatic fever, in scalded hands, etc., when the wrists are enveloped in dressings it would be necessary to undo them to reach the wrist, a proceeding fraught with pain and inconvenience to the patient. Again, if the patient is in a wet pack the temporal artery is available and the pack is not disturbed by pulse-taking.

In several other parts also it is at times necessary to find the pulse. Should, for instance, the leg bones be fractured and the leg tissues badly damaged, the question whether or not the tibial (leg) arteries are torn is an anxious one, as upon their being wounded or not the life of the parts below the seat of the fracture depends.

If both arteries are torn through, the parts will mortify; if only one is damaged the limb may be saved. To feel the pulse at the front of the ankle, place the fingers on the centre of the front of the bone (tibia) immediately above the ankle, where the anterior tibial crosses from the leg to the foot. To feel the pulse on the inner side, place the fingers in the centre of the hollow on the inner side of the ankle midway between the tip of the tibia (internal malleolus) and the most prominent point of the tip of the heel; here the posterior tibial artery passes from the back of the leg to the sole of the foot. The pulse may also be felt in the neck over the carotid artery; in the groin over the femoral artery; and at the bend of the elbow or inner side of the arm over the brachial artery.

Intermittent Pulse.—When a beat of the pulse is missed the pulse is said to intermit; with the fingers placed on the pulse, after, say, three or more beats there is a halt in pulsation, one beat is dropped, and the pulse again resumes its usual course. After another few beats it intermits again. The intermission may occur at every tenth, fifteenth, or twentieth beat, etc., or there may be no regularity in the intermission. The fact of the pulse inter-

mitting should always be recorded by the nurse; for although it may be due to such simple causes as smoking strong tobacco, drinking strong tea or strong coffee, or to an attack of indigestion during which the distended stomach presses on the heart and interferes with its action, yet it may on the other hand be a sign of heart trouble of a serious nature.

Irregular Pulse.—When a pulse beats very rapidly for a few strokes, then very slowly, and this condition is repeated indefinitely, the pulse is said to be irregular, and the fact must be noted by the nurse and reported to the doctor. In such a case several of the heart-beats may be too feeble to reach the wrist. In order to obtain a correct record of the frequency of the heart's action the nurse must place her hand on the patient's chest near the left nipple and count the apex beat for a full minute. In a normal male the heart's "apex beat" (H.A.B.) is situated half an inch internal to the nipple line in the fifth left intercostal space. There are many other features of the pulse which to a skilled observer convey meaning, such as its strength, hardness, softness, compressibility, wiriness, etc., but these are states that must be left to the doctor to test and pronounce upon.

Recording the Pulse.—The rate (or frequency) of the pulse is to be noted down at once; on the temperature chart a line will be found in which the rate for the morning and the evening may be filled in. The fact that the pulse intermits, or that it is irregular, may be noted on the back of the chart or in the nurse's case-book.

There is usually a marked relation between the rate of the pulse and the rate of breathing, each increasing and decreasing in proportion. In health, four beats of the pulse occur to every breath taken, and as a rule this proportion in disease is fairly well maintained. The rate of the pulse also corresponds in a certain degree with the state of the temperature of the body; thus, in high fever the pulse is usually quickened in proportion as the temperature rises,

and vice versa. In some instances, however, the pulse is slower than the increase of the temperature would seem to indicate, as in typhoid fever. It is therefore necessary to record all three—the temperature, the pulse, and the respirations—in every case of serious illness. In some cases of acute illness, in order to see at a glance alterations in pulse-rate, the record is made graphically on the temperature chart (*see* Fig. 19).

***Blood-Pressure.**—Accurate instruments for measuring the pressure of blood in the arteries are now

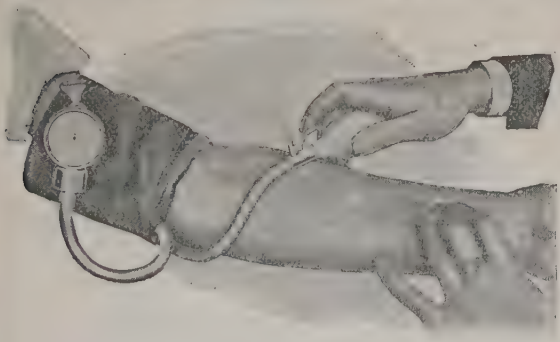


Fig 18.—Apparatus for taking the blood-pressure.

available. The duty of making these observations is often delegated to the nurse. When using the apparatus (Fig. 18) the armlet is first adjusted and the patient given the register to hold. The nurse then pumps in air with her right hand, keeping her left fingers on the radial pulse at the wrist. As soon as the pulse is obliterated the figure on the dial is noted. Air is then released until the pulse returns and the reading is taken.

In an adult patient the maximum blood-pressure ranges between 120 to 140 millimetres of mercury, when the patient is recumbent; the blood-pressure is

raised with temporary excitement, perhaps to 180 millimetres. In arterial disease (arterio-sclerosis) the pressure may even be as high as 250 millimetres or more. The risk such patients run of cerebral hæmorrhage can be readily understood. The blood-pressure is lowered in debilitating

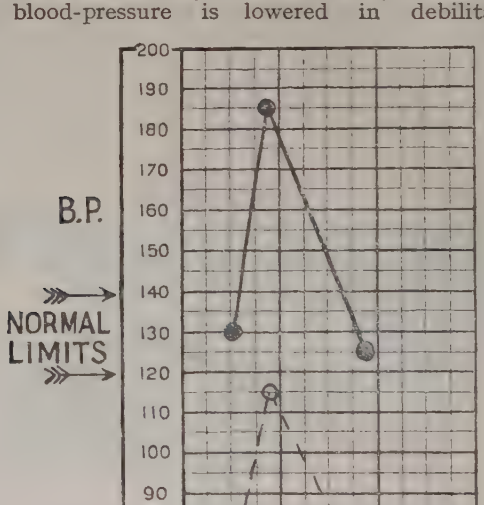


Fig. 19.—Blood-pressure and pulse chart. A rise in pressure following excitement is shown. Note simultaneous increase in pulse-rate (lower line).

diseases, such as anæmias and tuberculosis. In collapse or shock following operation or accident the blood-pressure may fall as low as 60 to 80 millimetres.

If the blood-pressure remains below 80 for more than three or four hours the patient cannot recover.

The readings are charted as shown in Fig. 19.

CHAPTER XI

RESPIRATION

Breathing in Health.—The rate of breathing in health varies from 15 to 18 or 20 per minute in the adult; it is higher in infants, and in old persons it may be quickened or slowed in harmony with the rate of the heart-beat as indicated by the pulse. In all inflammations and fevers the breathing is, as a rule, quickened; and in inflammation of the lung, bronchitis, and other affections of the respiratory tract, it may become laboured or a mere gasping. In other ailments the respiration is, as a rule, slower than normal, as in shock (collapse), opium poisoning, concussion and compression of the brain, etc.

To take the rate of the breathing, the nurse, with a watch in hand, counts the number of breaths for a full minute. If the patient is asleep, or unaware that the nurse is counting the respirations, there is no difficulty in ascertaining the rate correctly, either by listening to the breathing or by observing the rise and fall of the chest. If, however, the patient becomes aware of the fact that his breathing is being counted, he involuntarily alters the rate. This difficulty the nurse may overcome by a simple expedient. Placing her hand upon the wrist she pretends to take the pulse, and while doing so her hand rests upon the chest. The patient, thinking the pulse is being taken, breathes naturally, and a proper record can thus be obtained.

Breathing in Disease.—In health the respiratory act is quiet and regular, but in disease many modifications are met with, which will now be considered.

Rate.—The proportion of breaths to pulse-beats is in health about 1 to 4; but in pneumonia and other lung troubles the breathing may be almost as rapid

as the pulse. Pain in the chest, as from a broken rib or from pleurisy, etc., prevents sufficiently deep breaths being taken, and the respirations are hastened to make up for the small amount of air taken in at each act of breathing. In disease and injury of the brain the breathing is often slow and stertorous.

**Cheyne-Stokes Respiration.*—A curious form of "regular irregularity" of the breathing occurs where the brain is undergoing compression. It is usually met with in cases where the patient is unconscious and is suffering from meningitis, cerebral hæmorrhage, or the effects of injury to the skull. The breathing is at first almost absent, then very shallow, quickening and deepening until the maximum is reached. At this point the patient may become restless or excited and call out. The breathing then begins to fail again and gradually dies away until the silent (apnœic) period is reached. This cycle of changes is known as "Cheyne-Stokes Respiration."

Types of Breathing.—(*a*) When breathing is carried on mostly by expansion of the upper part of the chest (thorax) the respiratory act is said to be *thoracic* in type; this form of breathing is more commonly seen in women than in men. (*b*) In men and children the abdomen is seen to rise and fall during breathing, and the name *abdominal* is given to this type of respiration. In neither case, however, is one type of breathing followed to the complete exclusion of the other.

Breath-sounds in Disease.—Obstructions in the respiratory passages cause characteristic noises, according to the part affected :—

(1) *Sniffling* breathing is due to obstruction in the uose from accumulation of mucus. The nose may be the seat of polypus or other growths, thickening of membranes, etc., when the breathing will be stuffy, and one side may be more markedly blocked than the other. Infants are sometimes seen with stuffy noses and a yellow discharge from their nostrils. This may be a symptom of congenital syphilis, and is

known as "snuffles." There is actual disease of the bones inside the nose, and in later life the patient shows a characteristic deformity with a small nose with a depressed bridge.

(2) *Snoring.*—This is due to nasal obstruction, the patient breathing, when asleep, through the open mouth. The relaxed palate vibrates, causing the characteristic sound. In children and young adults the commonest cause is adenoids. This is a condition of the postnasal mucous membrane due to chronic catarrh. Polypoid overgrowth of the mucous membrane results and is usually associated with enlarged septic tonsils and swollen glands in the neck. If adenoids are neglected and not removed by the surgeon, characteristic deformation of nostrils, face, palate and jaws results.

(3) *Stridor, Spasm, or Whoop.*—When the larynx, in which the vocal cords are contained, is the seat of inflammation or spasm, inspiration is accompanied by *stridor*, that is, a loud, musical note, as in the "whoop" in whooping-cough.

(4) *Hoarseness.*—A hoarse, husky, or deep brassy voice indicates that the vocal cords are interfered with, owing to swelling of the mucous membrane in the neighbourhood of the larynx or to swelling of the vocal cords themselves. In inflammation of the larynx (laryngitis), scalded throat, diphtheria, or ulcers (often tuberculous) in this region, the voice is hoarse or reduced to a whisper. The commonest cause of hoarseness is laryngitis, that is, inflammation of the vocal cords. It is, however, sometimes a symptom of grave disease, either a growth on one of the cords or due to paralysis of one of the laryngeal nerves.

(5) *Wheezing.*—In asthma and bronchitis, wheezing may be distinctly heard, owing to the difficulty with which the air finds its way through the narrowed passage in the lung.

(6) *Mucous Rattle.*—The presence of mucus in the air-passages of the lungs and windpipe gives to

the breathing a rattle which persists until the obstruction is relieved by coughing. The "death rattle," as it is called, is due to the presence of mucus which it is impossible to expectorate.

(7) *Cough.*—In all obstructions to the air-passages due to presence of mucus, spasm, inflammatory swelling, tumours, etc., coughing, varying in nature according to the cause of the disturbance, is present. The act of coughing consists in a sudden explosive expiration after a deep inspiration, with the object of attempting to remove the obstruction. Coughing may come on in paroxysms, as in whooping-cough, or a single cough may recur at frequent intervals. The nurse should observe if the cough induces pain, as in pleurisy; whether it is a "dry" cough, as in the early stages of a common cold or simple asthma, when the cough is said to be a "hacking" cough. A cough becomes "moist" when mucus is freely expectorated.

Fig. 20.—Sputum pot with lid.

Sputum.—All matters expectorated should be received in a special vessel set aside for the purpose. One kind of receptacle is illustrated in Fig. 20. Another form is a jug with a movable funnel-shaped cover, and an aperture at the bottom of the funnel; in the jug a disinfectant fluid, such as weak lysol solution, should be placed. From time to time the jug and cover are to be scalded by pouring boiling water over them or, better still, they should be boiled for twenty minutes. When no regulation receptacle is at hand, a cup, tumbler, or jug may be used and a piece of linen rag dipped in carbolic laid loosely across the top. For cases of consumption various receptacles with the aperture and entrance

tightly closed by screw-fitting lids are made, so that they may be carried in the pocket, etc., and used as required. It is imperative that expectoration, especially of consumptive persons, be not deposited in public vehicles or even in the street. The object of the public notices forbidding spitting is to prevent the spread of consumption, for it is found that when the moist mucus dries, the germs (tubercle germs) contained in the sputum of consumptive persons become diffused in the air and may be inhaled by other people. When these germs get into the lungs of susceptible persons they are apt to cause infection, and so consumption is spread. If the nurse is asked to collect a specimen of sputum for examination by the pathologist, she instructs the patient to expectorate directly into the special sterilized bottle provided. This may contain a little sterile water, but no antiseptic, otherwise the germs may be killed and the object of the examination will be defeated.

Expectorated matters vary in appearance. (*a*) Frothy mucous sputum is met with in bronchitis ; (*b*) a purulent (pus) sputum is seen in cases of phthisis (consumption) ; (*c*) a muco-purulent expectoration consists of a mixture of (*a*) and (*b*) ; (*d*) prune-juice sputum consists of mucus mixed with altered blood : it is common in pneumonia ; (*e*) rusty sputum is also seen in pneumonia ; (*f*) currant-jelly sputum occurs in cases of lung cancer, pulmonary tuberculosis and heart disease ; (*g*) nummular sputum consists of round masses or lumps of yellowish material coughed up in advanced cases of consumption and certain other complaints ; (*h*) when pure blood is coughed up in quantity indicating that hæmorrhage is taking place within the lung, it is termed hæmoptysis. Blood from the lung is distinguished by its bright-red colour and its frothy appearance when in moderate quantity. The sputum may have a fetid odour, owing to the putrefaction going on within the lung tissues. Hæmoptysis

nearly always means that the patient is suffering from pulmonary tuberculosis.

The quantity of sputum expectorated in the twenty-four hours should be noted by the nurse; for this purpose jugs or cups with measurements of their fluid capacity marked on the inside are used; but any ordinary receptacle, the capacity of which is known, may be employed. When large quantities of purulent sputum are got rid of periodically, there may be a large cavity in the lung which only empties at intervals. This condition is known as "bronchiectasis."

Hiccough, or **hiccup,** is caused by a spasm of the diaphragm. It is a common sign in indigestion, owing to the stomach pressing upon and irritating the diaphragm. When it occurs in the course of serious abdominal ailments, its persistence is an unfavourable indication, often presaging a fatal issue.

Sighing and Yawning are frequently due to intermittent action of the heart, brought about by distension of the stomach, from the gases generated by indigestion pressing up the diaphragm and interfering with the action of the lungs. The sigh and the yawn are, in these circumstances, endeavours to make up for the deficiency in respiration by a violent effort.

To Relieve Cough.—Many expedients are adopted for this purpose, and their very number shows that there is no "cure." To stop a cough by administering sedatives is wrong in principle and practice, for coughing and the expectoration which accompanies it are nature's method of getting rid of abnormal and deleterious secretions. Children frequently swallow the sputum, and consumptives at times do so, especially when in company, hawking and spitting being offensive to others. Swallowing expectoration, especially in cases of consumption, is, however, provocative of evil consequences, and should be avoided.

When the cough is "dry" or "croupy," moist air may be administered either by a bronchitis tent in the case of children (*see* Fig. 2, p. 19), or by inhaling steam from an inhaler. The simplest form of supplying steam or moistened air for inhalation is by putting the head, covered by a towel, over a basin or jug of boiling water (*see* p. 51); there are also methods of a more elaborate kind Various medicinal substances may be added to the hot water in an inhaler; one of the commonest is tincture of benzoin (friar's balsam), a teaspoonful of the tincture to a pint of boiling water. For coughs due to affections of the throat and the larynx there are many kinds of spray apparatus; these are generally ordered by the doctor, together with the fluid to be used in the apparatus.

A mouthful of hot water will often allay the cough of hiccup; lozenges, jujubes, pastilles, etc., are to be had in plenty at every chemist's, and most of them do good by the fact that their presence in the mouth causes a flow of saliva in a quantity which, when swallowed, tends to alleviate irritation; the medicinal agent contained in them is of quite secondary importance.

Hiccup, if due to indigestion, may be relieved by sips of hot water, held in the mouth for, say, a minute, so as to check the rhythm of the contraction of the diaphragm which causes the hiccup. To the hot water a pinch of bicarbonate of soda may be added; the ever-popular peppermint drops or lozenges also serve to check the spasm. A mustard plaster applied for ten to fifteen minutes over the "pit of the stomach" just below the lower end of the breast-bone may prove serviceable. For hiccup coming late in a disease, as in peritonitis, little can be done; in such cases treatment must be left to the doctor.

Position.—When a patient in bed is seized with a paroxysm of coughing, relief is usually found by changing from a lying-down to a sitting posture.

In asthma, chronic bronchitis, and some heart affections, and in convalescence from most ailments, a high pillow, or support by a bed-rest, is essential to comfort and breathing. When pain is present, as in cases of broken ribs, pleurisy, inflammation of the liver, etc., the patient assumes the position in which relief from pain is best obtained, and as a rule this posture should be allowed. But, however enjoyable for a short time, bed-rests soon become irksome, and if used during a protracted illness for too long a time, the patient gets exhausted, as

Fig. 21,—Bed-rest.

indicated by pallor, a failing pulse, thirst, and a desire to lie down. This desire should be acceded to. Whilst raised in bed on a bed-rest it is essential that a dressing-jacket or dressing-gown be worn, or that a light shawl be thrown round the neck and shoulders, so as to avoid exposing the upper part of the body to chill.

Bed-rests may be of the regulation patterns sold by instrument makers, or improvised by an inverted chair, by stools, or by a sufficiency of pillows. Whatever the form, it is advisable to place a pillow, a

covered stool or box, or any convenient article at the foot of the bed beneath the bed-clothes so that the feet may rest against it and thus prevent the patient from slipping down from off the bed-rest. Another plan is to raise the end of the bed by placing blocks of wood or bricks beneath the two lower posts of the bedstead. The patient's position can be altered from time to time by varying the elevation of the support for the back by means of the catch and notches on the frame (Fig. 21). If pillows are used instead of a bed-rest, one should be added, or taken away, as occasion arises. From time to time the nurse should ask the patient such questions as, Are you comfortable? Would you like me to alter the bed-rest? Are you too cold, or too hot?—and not wait for the patient to complain.

***Definitions.**—The following terms are in common use in reference to ailments and conditions of the respiratory tract :—

Epistaxis is hæmorrhage from the nose due either to injury, to local diseases of the nostrils, or occurring in the course of general diseases, such as anæmia (bloodlessness) or Bright's disease (kidney affection).

Aphonia, loss of voice.

Laryngitis, inflammation of the larynx.

Stridor, a harsh, high-pitched sound, due to spasm of the vocal cords in the larynx obstructing the passage of air and causing a sound like wind whistling through a narrow aperture, as in whooping-cough.

Laryngismus stridulus (crowing), a sudden spasm of the larynx occurring in children, especially in those suffering from rickets. The attack may develop suddenly in the night without previous warning, or it may occur in the course of laryngitis.

Dyspnœa, difficulty in breathing. It is accompanied, as a rule, by loud noises during either inspiration or expiration, or both.

Asphyxia, suffocation or suspended animation. It is due to an insufficient amount of oxygen reaching the blood, as in choking.

Cyanosis, blueness of the skin. When asphyxia is very deep, the features assume a bluish, congested appearance.

Bronchitis, inflammation of the bronchial tubes. Bronchitis may be (*a*) acute, when there will be fever, pain on coughing, and some dyspnœa; or (*b*) chronic, a long-continued form of bronchitis, with periods of quiescence; there is cough, little or no fever, usually considerable expectoration, and gradual damage to the lungs.

Pneumonia, inflammation of the lung. There are several varieties; the chief are: (1) *Catarrhal*, sometimes termed *bronchial* or *lobular* pneumonia. The disease generally commences as a cold or catarrh, and from the bronchial tubes the inflammation reaches the ultimate recesses of the air-passages—the lobules of the lung; hence the terms catarrhal, bronchial, and lobular, applied to the condition. The whole of both lungs is more or less affected in lobular pneumonia. (2) *Lobar* pneumonia signifies that one or more lobes of the lungs are attacked. The attack is characterized by high fever, dyspnœa, and blood-stained expectoration. Lobar pneumonia usually ends in a week by a sudden fall of temperature (fall by crisis). The breathing in pneumonia is characteristic. The patient breathes 40 or more times to the minute with short panting respirations. In children the nostrils move with each breath (dilatation of the alæ nasi muscles).

Pleurisy (inflammation of the pleura), the lining membrane of the lung. In the acute form it causes sharp pain (a stitch), fever, and a dry cough. The patient lies, as a rule, on the affected side. The pleurisy may result in the outpouring of serous fluid into the chest cavity. This is known as a pleural effusion. When this effusion becomes purulent it is known as an empyema.

Pneumothorax.—Air may be introduced into the pleural cavity either from injury such as a fractured rib penetrating the lung, or from a bronchus giving

way as the result of ulceration from disease. This condition of air in the chest is known as pneumothorax. At the present time air is introduced into the chest in order to collapse and rest the lung in certain cases of one-sided pulmonary tuberculosis. This treatment is known as "artificial pneumothorax."

CHAPTER XII

BATHS AND BATHING

THE effects of a hot or a cold bath upon the system differ widely. Leaving aside the hygienic aspect of cleanliness, a bath produces physiological effects upon the circulation of the blood and the nervous system in proportion to the temperature of the water, the strength of the individual, and the length of time to which the bath is prolonged. The effect of immersion in warm or hot water is to dilate the blood-vessels of the skin and "attract" blood to the surface of the body; the effect of a cold bath upon the body is to "drive" it from the skin to the deeper-seated organs and tissues of the body. A bath of hot or cold water has therefore a marked effect upon the body, which may be good or bad according to the circumstances.

Temperature of Baths.—The temperature of different kinds of baths, from hot to cold, is as follows :—

Hot bath	..	100° to 106°	Fahr.
Warm bath ..	..	95° „ 100°	„
Tepid bath ..	..	85° „ 95°	„
Temperate bath ..	..	75° „ 85°	„
Cool bath	..	65° „ 75°	„
Cold bath	..	34° „ 65°	„

It will be seen, therefore, that water at, or a degree or two above or below, the normal temperature of the body (98·4° Fahr.) constitutes a warm bath; water a little above the temperature of the body constitutes a hot bath, and water a little below the temperature of the body a tepid bath. In cases of illness the temperature and duration of the bath should be prescribed by the doctor. The temperature is ascertained by means of a bath thermometer (Fig. 22).

When preparing a bath for a convalescent patient,

first close the windows of the bath-room. Proceed to fill the bath to a sufficient depth with water at a temperature of about 100° Fahr. Test the temperature with a bath thermometer. Run in cold water first, adding the hot water until the correct temperature is arrived at.

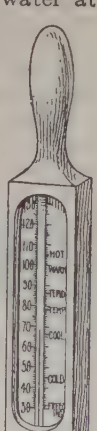


Fig. 22.—Bath thermometer.

The bath should never be prepared more than half full. Always remain within call of the patient and see that everything that may be required (dressing-gown, slippers, soap, towels, etc.) is put ready before the bath commences.

Special Baths.—The nurse should be familiar with the following baths that may be ordered.

Shower Bath.—A shower bath consists of the direct descent of a quantity of water issuing through small apertures from a cistern overhead on to a person standing beneath.

Hot-air Bath.—This is usually given nowadays by suspending electric lamps from a full-length cradle which is placed over the patient (Fig. 23). A mackintosh and blanket are first placed beneath him, and his night-shirt taken off. A small blanket is laid over him, the bed-clothes are removed, and the cradle is arranged so as to cover the whole body from the shoulders downwards. The cradle is covered with a blanket, that with a mackintosh, and that again with a second blanket. The object of the mackintosh is to prevent the escape of hot air. The blankets are well tucked in, and a cloth rung out of iced water should be placed on the patient's forehead, and frequently changed. Cold drinks may be given to encourage the flow of perspiration. The bath thermometer is placed inside the cradle where it can easily be got at. After the electric current has been turned on, the patient should not be left

alone in the room. A hot-air bath usually lasts for about fifteen minutes after the patient's skin has begun to act, but at the first sign of faintness the lamps must be put out. A high degree of dry heat can be tolerated with impunity, but the usual temperature varies from 120° to 140° Fahr.

When the bath is finished, turn off the heat, and remove the cradle, leaving the patient covered with the warm blankets for about half an hour; then

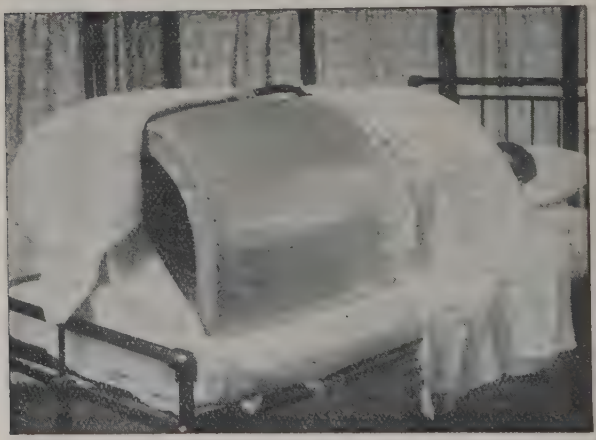


Fig. 23.—Electric cradle.

rub him down with hot towels, put on a warm shirt, remove the under mackintosh and blanket, and make up the bed in the usual way.

This form of treatment is useful when it is necessary to make the patient sweat in some forms of reducing disease, also in conditions where it is required to raise the body temperature, such as traumatic shock, or shock following severe burns in children.

An improvised hot-air bath is shown in B.R.C.S. Manual No. 1, p. 283.

Treatment of the Febrile State

The heat generated in the body is got rid of by the excretory organs, the skin, the lungs, and the kidneys. In the febrile state these organs naturally play an active part, and by various devices their action in this direction can be helped. The skin is by far the most important of them, and it is more accessible to external remedial measures than any of the others.

When the Fever is Slight or Moderate.—(1) Send the patient to bed ; this is always the best and safest plan when it can be managed. Sitting before a fire or lying on a sofa, however well wrapped up, does not give the general warmth afforded by being in bed.

(2) Encourage perspiration by placing the patient between blankets, covering with extra blankets, increasing the heat of the air in the room, placing hot-water bottles between the blankets, giving hot drinks, such as hot tea, coffee, milk, home-made lemonade.

(3) Certain drugs promote perspiration. These are left to the doctor to prescribe, but stimulants in small quantities and proportionate to the age and strength of the patient may be added to any of the hot drinks. In the case of an adult a teaspoonful of brandy or whisky added to hot coffee or milk will further stimulate the action of the skin ; but alcohol, except in an emergency, should not be resorted to without the doctor's advice.

(4) A purge, by the abstraction of an increased amount of warm excretion in a fluid form, is a direct means of carrying off excess of temperature. Salts, in the form of Epsom salts, Glauber's salts, or any one of the many purgative waters in use, serve better for this purpose than vegetable purgatives such as rhubarb, castor oil, etc.

(5) The hot drinks given to promote the action of the skin help also to flush the kidneys, and by increasing the excretion of warm fluid from the body the excess of heat is reduced.

(6) Washing the body once or twice daily favours the escape of heat by evaporation and also by removing the organic materials which condense in the skin and hamper the action of the sweat-glands.

When the Fever is High.—In cases of very high temperature, 106° Fahr. and over (hyperpyrexia), steps should be taken to check and reduce it. Independently of drugs there are several methods of abstracting heat by way of the skin. Before treatment is begun the patient should be placed between blankets, and the mattress protected by mackintosh sheeting. Take care to expose the patient as little as possible.

(1) *Tepid Sponging.*—This is a very important procedure, and should be carried out in all cases when the temperature rises above 103° Fahr. Lowering the temperature greatly adds to the comfort of the patient, and diminishes the damaging effect of a high temperature on the system. The articles necessary are, bath and clinical thermometers, long mackintosh sheet, two bath blankets, towels, sponge, basin of water with vinegar, can of hot water, etc. Prepare the patient as for a blanket bath (*see* p. 85), apply a cold compress to the head, take his temperature and pulse. Commence sponging the patient, employing long single strokes, with the sponge so wet that, each time it touches him, only a few drops of water escape from it. The water should be at a temperature of 90° Fahr. gradually cooled down as required. The chest and abdomen should be kept exposed during the whole of the sponging, and kept constantly wet.

After sponging for ten minutes take the patient's temperature and pulse. Keep on with the treatment until the temperature is sufficiently reduced.

When this is accomplished, partly dry the patient with a towel, remove bath blankets, re-dress and make up the bed, using one blanket only. The patient should then be encouraged to sleep. If there are any signs of collapse or the patient shivers, stop the sponging, apply hot-water bottles and give a hot drink.

(2) *Sponging with cold water*, which may be still further chilled by adding ice to the water, is a potent method of lowering the temperature.

(3) Wrapping the patient in a wet sheet at the temperature of the body and rubbing ice upon the sheet so as gradually to cool it is a safe and efficacious method of abstracting heat from the body in cases of very high fever. The process must be stopped as the temperature falls to about 100° Fahr.; the patient's skin is then dried and he is placed between dry blankets.

To Apply a Wet Pack.—Over the mattress of the bed place a mackintosh, then two dry blankets, and on the blankets spread a large wet sheet wrung out of cold or warm water. The patient, unclothed, is placed on the wet sheet, and wrapped up in it from neck to toes, each limb being separately wrapped up so that the whole of it is enclosed in the sheet. Blankets are then placed over the patient to the number of three or four or more. Whilst thus wrapped up the patient is carefully watched; the pulse is taken at the temporal artery, the rate of breathing observed, the temperature taken, the colour of the face noted as to pallor, congestion, or distress. When the temperature falls to about 100° Fahr., or if any sign of distress or collapse threatens, the treatment must be discontinued. Twenty minutes is the usual period of application. At the end of this time the covering blankets and wet sheet are rapidly removed, the patient's body dried quickly, and he is placed between dry blankets or transferred to another bed for a time. Pieces of ice may be given to him to suck whilst in the pack, or, if preferred,

hot drinks to promote perspiration and relieve thirst, and stimulants may have to be administered afterwards to favour reaction if the patient is exhausted, or to promote perspiration. A wet pack should not be given unless ordered by a doctor, and should never be administered except in the presence of or by a trained nurse.

CHAPTER XIII

SIGNS OF INFLAMMATION

THE classical signs of inflammation are Heat (*calor*), Redness (*rubor*), Swelling (*tumor*), Pain (*dolor*).

Inflammation generally depends on the presence of germs, although sometimes it may express reaction of the tissues to injury or chemical poisoning.

In inflammation local symptoms first develop, to be followed later by general or constitutional symptoms due to the absorption of the poison.

***Description of the Inflammatory Process.**—Nature provides the body with very wonderful means of resisting disease. In the first place local resistance of the tissues will be described (Fig. 24).

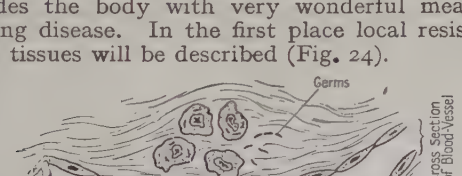


Fig. 24.—Diagram of tissue changes in inflammation.

If the web of a frog's foot, which is transparent, be placed under the microscope and a drop of croton oil applied, the capillaries will be seen to dilate, thereby allowing more blood to flow through the part. This explains the two signs of Heat and Redness.

Soon afterwards the white cells (leucocytes) of the blood will be observed creeping out of the vessel walls.

These white cells have the power of dealing with foreign bodies and will actually eat and digest germs.

These cells go on accumulating and digesting dead tissues until an abscess, containing pus, is formed. The nerves in the neighbourhood get

pressed on by this swelling. This explains the Pain and Swelling of inflammation.

If the inflammation is limited in extent, the abscess may digest its way through the tissues and burst through the skin, or be opened by a surgeon. In this case the poison escapes, repair sets in and the discharge stops, and the patient eventually recovers. Otherwise if the poison goes on developing, the germs multiply so rapidly that the white cells can no longer deal with them and the germs, entering the blood-stream, are distributed all over the body, producing a condition known as blood-poisoning or septicæmia.

Nature's second line of defence now comes into play. The fluid portion of the blood, called serum, possesses remarkable properties.

Some poisons are directly neutralized and destroyed by antitoxins. In other cases the germs may be killed and dissolved (bacteriolysins), or they may be dealt with in other ways.

Some poisons are so powerful that the red cells in the blood are destroyed (hæmolysis). This happens in some cases of snakebite and infection by virulent septic organisms known as streptococci.

Treatment of Inflammation.—From these remarks will be readily understood the principles on which the treatment of inflammation is based.

In the first place the *general* treatment of the patient is most important. The inflamed part must be kept at rest to prevent the spread of the disease. When constitutional symptoms are present, absolute rest in bed is essential to prevent a spread of the poisons over the body. This is well known in cases of chronic tuberculosis, where profound rest alone will bring down the temperature. A rise immediately follows the slightest exertion such as restlessness or undue movement in bed.

In addition to the above measures, the patient must be kept in the best possible hygienic surroundings and given the most nourishing diet available.

Flushing the body by means of forcing fluids dilutes the poison, and helps to remove organisms by the kidneys.

It has also been recently found that in these cases the germs are passed into the bowel. The usefulness of aperients, which has so long been known, is thus explained.

Special treatment can be adopted in specific infections. In diphtheria, snakebite and tetanus, and some cases of pneumonia, antitoxin is given in the form of serum. In other conditions preparations of killed germs (vaccines) are injected.

Local Inflammation. *Prevention.*—In rendering first aid to a surface wound, success will depend primarily on the mechanical removal of dirt and germs. The use of soap and water, and if possible allowing water to run over the injured part, is the best method of carrying out this cleansing process.

Secondly, it must be remembered that nature provides some measure of defence against the entrance of organisms into the system.

The inclination to use strong antiseptics with the idea of killing germs must be curbed. It is impossible to kill living germs in the tissues. On the other hand the delicate tissue cells are destroyed, thereby allowing the germs to enter more freely, and at the same time providing them with food material on which they flourish.

Treatment of Established Inflammation.—(1) The part must be kept at rest by provision of a suitable splint, arm sling, etc. (2) The blood supply to the part must be encouraged; this is commonly done by the application of moist heat.

Fomentations.—To prepare a hot fomentation for application to inflammation on the back of the hand, for example, the following articles are necessary, viz. a supply of boiling water, a clean towel or strong piece of lint for use as a wringer, boracic lint, waterproof protective tissue, wool, bandage and a basin.

Place the open wringer across the basin with a piece of boric lint, cut to a suitable size to form a double layer, in the centre. Pour the boiling water

Fig. 25.—Wringing a fomentation.

on until the lint is well soaked, then, seizing the wringer at both ends, twist the hands in opposite directions (Fig. 25). As soon as it is sufficiently dry apply quickly to the affected part. The boracic

lint should be picked up and shaken out by being held in two pairs of sterilized dressing forceps, care being taken to place the smooth surface of the lint next the patient's skin. The lint is then covered with the waterproof tissue to retain the moisture, with a layer of wool to retain the heat, and finally kept in position by a bandage.

Poultices.—The preparation and application of poultices in septic conditions should no longer be carried out. An improved method consists in the application of some clean preparation such as Antiphlogistine. This may be kept in position for twenty-four hours. In some cases where this is not available a linseed meal poultice may be applied.

To Make a Linseed Meal Poultice.—The requisite articles are: (1) Crushed linseed, that is, linseed merely crushed but from which the oil has not been expressed. Linseed meal without the natural oil it contains is too dry for poultice-making; if, however, the crushed linseed cannot be obtained, it is necessary to add some olive oil or linseed oil to the meal whilst making the poultice. (2) A piece of lint, linen, cotton, brown paper, tow, or cotton-wool is used on which to spread the poultice; this is placed on a piece of wood or on a table, but not on the marble slab of the washstand, which is apt to render the poultice too cold. (3) A suitable basin or bowl. (4) A tablespoon or a large table knife or a spatula. (5) A kettle with boiling water.

When the kettle is boiling, pour a little of the water into the basin to be used; swill the water round the basin until it is quite warm; pour the water out of the basin, as it is made cold in the process of warming the cold basin; again pour boiling water from the kettle into the basin, in quantity proportionate to the size of the poultice to be made: a little experience will determine the quantity necessary. Now take a handful (or spoonful) of the crushed seed and let the meal trickle through the fingers, keep stirring with a spoon,

spatula, or large knife, and add sufficient meal until the poultice is quite thick. Test the thickness by standing the spoon in the centre of the poultice mass; if the spoon stands upright or falls gently against the side of the basin, or if the mass comes away clean from the sides of the bowl, the poultice is known to be sufficiently thick. The poultice mass is now turned out on to the linen, paper, or tow, and spread evenly, leaving a portion, to the extent of about an inch all round, uncovered by the linseed. To facilitate spreading, dip the handle of the spoon or the blade of the knife or spatula into

Fig. 26.—Poultice ready for application.

hot water; this expedient prevents the poultice from adhering to the spoon, knife or spatula, and ensures a smooth surface to the poultice mass. The edges of the cloth are now turned up so as to overlap the margins of the poultice all round (Fig. 26). Before the poultice is applied it is well to test its heat by holding the back (covered side) of the poultice against the cheek or the back of the hand; this will guard against the poultice scalding the patient. When the poultice is applied to the skin it is kept in place by a bandage sufficiently tight to prevent slipping. If the patient is in bed no further covering is required, but if he is up and going about, it is necessary to cover the poultice with cotton-wool or a piece of flannel before applying the bandage,

so as to ensure the maintenance of heat which is the object of its application.

In making and applying a poultice, the following points should be remembered :—

(*a*) Boiling water can only be obtained from a kettle, saucepan, etc., just taken off the fire. It cannot be obtained when the water is transferred to a jug, and carried from the kitchen to the sick-room or ward. The poultice must be made, therefore, in the room in which the kettle boils. If instead of the poultice being made in the sick-room or adjacent dressing-room it is made in the kitchen, it must be put between two hot plates and so carried to the bedside.

(*b*) A poultice should not be a sloppy mass, but of rather firm consistence, so as to bear the "spoon test."

(*c*) Do not put a piece of muslin over the poultice ; this custom came into use because of the tendency to make the poultice mass too thin ; in consequence of which it sticks to the skin when being removed. A properly made poultice—that is, one of which the consistence is sufficient to allow of a spoon standing upright in it—does not stick to the skin, and the necessity for a piece of muslin to prevent this betokens ignorance on the part of the poultice-maker. Further, muslin does away with much of the good the poultice is presumed to do ; for inasmuch as between the warm poultice and the skin a stratum of moisture intervenes, the presence of a layer of muslin absorbs the moisture and conducts it to the margins of the poultice, where it escapes on to the clothing, and even the sheets are kept in a constant state of dampness.

(*d*) To be of any value, a poultice must be well covered up after it is applied. There is no virtue in a linseed meal or other poultice, except that it conveys heat and moisture to the skin. If it is allowed to become cold after application, it is quite useless. A poultice becomes cold only by being

insufficiently covered, and from no other cause. This may be proved by taking the temperature of the poultice. When a thermometer is pushed in between the skin and a well-covered poultice, the temperature will be found to be the same as that of the patient's body, namely 98·4° Fahr. if the body temperature is normal. If the poultice is insufficiently covered, its temperature will fall to the temperature of the air around. The temperature of a well-covered poultice never falls below that of the body, even if the same poultice is kept on for a day. Why, then, change a poultice? Because it gets dry and foul and smells badly, owing to its being saturated with organic materials from the skin. How often should a poultice be changed? Every four hours. Why? Because at the end of four, or at most six, hours it becomes dry, and smells, and crumbles away into the dry meal of which it was made, and the meal escapes into the bed and around the patient.

Application of Cold.—In some cases the application of cold is advised. This is best done by the use of evaporating lotions, which are constantly applied to a bandage over the affected part. In these cases care must be taken to protect the bedding, and to allow free access of air surface.

Counter-Irritation.—With the advance of medical science counter-irritation is now seldom employed as a treatment.

Mustard Leaves.—These are useful in some cases of vomiting. The plaster is warmed in hot water and removed after 15–20 minutes.

Blisters may sometimes be ordered. The blistering plaster cut to the required size is applied and left on until a blister is raised. The plaster is then removed, the blister punctured with a sterile needle and covered with a sterile dressing.

Leeches are hardly ever used at the present time. They were formerly used for the local extraction of blood from the tissues.

CHAPTER XIV

INFECTION AND INFECTIOUS DISEASES

THE more common acute infectious febrile diseases which occur in Britain are scarlet fever, measles, German measles, smallpox, chickenpox, typhoid (enteric) fever, mumps, whooping-cough, diphtheria, and influenza.

In addition to the above diseases will be added a brief description of cerebro-spinal meningitis, tetanus (lock-jaw), gas-gangrene, encephalitis lethargica and erysipelas.

Rarer infectious diseases are typhus fever, plague, and cholera.

Tuberculosis, or disease due to infection by the tubercle germ, may attack almost any and every organ of the body, but it is chiefly regarded as an affection of the lung, causing phthisis or consumption. Rheumatic fever, a severe scourge in Britain, has not yet been proved to be infectious, but in all probability it will be found to be so.

Terms in Common Use.—By a *specific* ailment is meant a disease produced by an infection or an infective organism which has the power of producing the disease special to itself and no other; thus, the typhoid fever germ can give rise to typhoid fever only, the plague germ to plague only, the diphtheria germ to diphtheria only. The word *zymotic* is frequently used to express the whole group of acute specific diseases.

A *sporadic* outbreak means that a case of the disease occurs here and there, but that it is not widely diffused; thus we may have a few sporadic cases of Asiatic cholera in our seaports now and again, but the disease dies out after attacking a few persons. When a disease is termed *endemic* we mean that the disease is local, or prevalent in a particular district,

beyond which it does not spread, except occasionally. An *epidemic* signifies a widely prevalent and rapidly spreading outbreak of disease, many persons being attacked about the same time. Thus plague, which is endemic in certain small areas in Northern India, Mongolia, and possibly Central Africa, may spread, at intervals of a century, to other areas and become epidemic in many parts of the world. The term *pandemic* is applied to a more or less universal outbreak of a particular disease; influenza affords the best example of a pandemic ailment.

The terms *contagious* and *infectious*, applied to the communicability of disease, do not to-day bear the distinct significance once applied to them. Contagion meant conveyance of disease by actual contact with a person suffering from a communicable disease; infection was applied to the possibility of acquiring disease by channels other than by personal contact. The term contagion has fallen into disuse, as almost all diseases are now proved to be infectious through the medium of air, water, food, clothing, or insects.

How Infection is Transmitted.—Infection is conveyed to the body by one of three channels: (1) *Respiration.*—The infecting organism (germ, microbe, bacterium, bacillus) may enter the body by way of the air taken into the lungs. This method of infection is known as *inhalation.* The principal ailments conveyed in this way are measles, influenza, scarlet fever, whooping-cough, tuberculosis (consumption), mumps, and perhaps chickenpox. (2) *Digestive tract.*—In food, water, milk, etc., the germ of infection may be conveyed. Examples of diseases thus conveyed are typhoid (enteric) fever, diphtheria, and cholera. Certain diseases are conveyed by both the respiratory and digestive tracts, such as scarlet fever and tuberculosis. The method of infection following the swallowing of germs is spoken of as *ingestion.* (3) *The skin.*—The bites of insects have of late years been proved to be a fertile channel of infection; the bites of certain animals

also are known to convey infection. Thus hydrophobia is communicated by dog-bites; malaria and yellow fever are transmitted from an infected to a healthy person by mosquitoes; plague is conveyed to man by fleas from rats and other animals suffering from the disease; sleeping sickness is set up by infected tsetse-flies; leprosy and typhus may be carried by lice, etc. During the Great War the body louse was found to transmit the disease known as trench fever, and rats were found to convey several rare diseases.

Toxic is a term employed to express poisoning by toxins—the poisons produced by the action of germs. In diphtheria, for instance, the diphtheria bacilli in the throat generate a toxin which, when it is absorbed in the blood, causes an intoxication characterized by serious symptoms. The blood is poisoned (toxæmia) and, as with any other poison taken in large quantity, by accident or purposely, the struggle for life is severe. It is not the presence of bacteria alone that makes the patient ill, but the poisons they produce. The expression *auto-intoxication*, now so frequently used, means self-intoxication; that is, the individual becomes the generator of the poison by which he is made ill. The chief seat of production of self-generated toxins is the alimentary canal; decayed teeth, stomach and intestinal disturbances, as indicated by indigestion, constipation, etc., are especially favourable to the prolific growth of organisms producing auto-intoxication.

Fomites.—These are substances capable of retaining infection and of being the means of propagating an infectious disease; the most important fomites (pronounced fo'-mi-tēz) are bedclothes, bedding, night-dresses, carpets, curtains, towels and letters. It must be remembered also that infection is carried by dirty hands, dirty instruments and utensils, and that bad water supply, contaminated food, defective drains, and a foul atmosphere are all means of conveying and propagating infectious disease.

Stages of Infectious Fevers

The infectious fevers run through stages which conform to a more or less common type, as follows :—

1. **The Period of Exposure.**—This may be known or unknown. If one has visited a person suffering from an infectious disease, and at some definite time afterwards develops the same disease, the period of exposure is exactly known. If, however, the disease is "caught" whilst travelling in public vehicles, or at public gatherings, it may not be possible to trace the source of infection and determine the period of exposure.

2. **Period of Incubation.**—When the disease-producing germs have been taken into the body, either by way of the breath, the food or the skin, the infected person does not at once develop the symptoms of disease, and it may be days or weeks before the illness declares itself. During the interval between the exposure and the onset of feverishness the germs that have gained access to the body are developing, multiplying, hatching or incubating, and it is only when this process is well advanced that the patient becomes feverish. A few hundreds or thousands of germs taken into the body may not cause any evil consequences ; but if they multiply to the extent of hundreds of millions their presence is made known by the development of the specific disease they are capable of producing. During the period of incubation the infected person does not, as a rule, feel ill, and will be able to continue work and take food with appetite. Persons in the incubation stage are seldom infectious to other people.

Owing to the natural immunity of resistance of the body the absorption of the disease germs does not necessarily mean that a given patient will contract that particular illness.

**Table of Incubation Periods in Different Infections*

Disease.	Incubation Period.	Disease.	Incubation Period.
Scarlet Fever ..	1 to 8 days	Smallpox	10 to 14 days
Measles	7 to 14 ,,	Chickenpox ..	14 to 16 ,,
German Measles ..	9 to 19 ,,	Typhoid Fever ..	3 to 23 ,,
Whooping-cough ..	7 to 19 ,,	Typhus Fever ..	5 to 14 ,,
Diphtheria	2 to 10 ,,	Plague	2 to 5 ,,
Mumps	14 to 28 ,,	Cholera	2 to 5 ,,
Influenza	1 to 4 ,,	Yellow Fever ..	3 ,,

To simplify this table, and taking to the eighth day to represent seven completed days, the maximum incubation periods of the several diseases mentioned may be grouped as follows :—

Maximum Incubation Period 1 Week.	Maximum Incubation Period 2 Weeks.	Maximum Incubation Period 3 Weeks.
Scarlet Fever.	Measles.	German Measles.
Diphtheria.	Whooping-cough.	Mumps.
Influenza.	Smallpox.	Typhoid Fever.
Plague.	Typhus Fever.	Chickenpox.
Cholera.		
Yellow Fever.		

3. **Period of Invasion.**—When symptoms of fever develop they are usually marked by loss of appetite foul tongue, thirst, headache, backache, pains in the limbs, sometimes vomiting and purging, increased temperature, quickened pulse and respiration. In other words, a state of feverishness occurs. In some ailments headache is more severe than in others, or, again, it may be backache that is complained of, whilst in others disturbance of the nervous system or of the digestion is more pronounced. The symptoms, however, form collectively a state of feverishness, a term which is well understood. The period of invasion in many acute specific diseases ends in a rash or eruption.

4. **The Rash or Eruption.**—In the so-called erup-

tive fevers the rash may present itself in a day or two after the commencement of the feverishness, or it may be as late as a week or more before it is seen. Spots develop, or a general rash appears, the date of its appearance varying with the specific ailment. The following table presents this in an easily understood form :—

* Disease.	Day on which the Rash Appears.
German Measles ..	First.
Chickenpox. ..	First and second.
Scarlet Fever ..	Second.
Smallpox	Third.
Measles	Fourth.
Typhus Fever ..	Fifth.
Typhoid Fever ..	Eighth or ninth, if at all.

The presence of an eruption on the skin is an indication that the poison—that is, the germs or their toxic products—is leaving the body ; for the skin is one of the principal organs of excretion. In the elimination of the poison each of the organs of excretion plays its part in degrees varying according to the specific nature of the ailment, and each of them may become seriously affected whilst it is thus ridding the body of poisonous material.

The channels by which the infectious germs and their products (toxins) escape from the body are the skin, the lungs, the kidneys, and the intestines—the four excretory organs.

(*a*) *The Skin.*—Richly supplied with blood-vessels, the glands of the skin abstract fluid from the blood, and get rid of it by means of the sweat (sudoriparous) glands. The perspiration consists of a clear fluid which has, dissolved and suspended within it, organic matters and salts of various kinds. The organic substances, when the fluid portion of the excretion evaporates, are left on the surface, and cause the dirty accumulation seen on the skin when it is not washed sufficiently often. In disease the excretory

functions of the skin have extra work to do as a rule, for perspiration in fever is often profuse. In addition, the germs, the toxins, and material such as pus, abscesses, and cores (sloughs) from boils, carbuncles, etc., gain exit by way of the skin. Thus the skin in these ailments is called upon to do more work than it can normally accomplish, and, becoming irritated, as it were, in the process of elimination, develops a general redness as in scarlet fever, spots as in measles, blebs (blisters) as in chickenpox, small dead cores as in smallpox.

(*b*) *The Lungs.*—The lung is an excretory organ of great importance. Not only is carbonic acid gas given off by the breath, but also organic substances, heat and moisture. In tuberculosis the germs are present in the sputum, and, becoming diffused in the air after expectoration, are inhaled by other people. In the pneumonic form of plague a patient may cough the sputum on to the nurse's face, and infect her through the eyes, nose or mouth. In diphtheria, also, the breath of the spray from coughing may infect others who come close to the patient. The nasal discharges, and possibly the breath, in cerebro-spinal meningitis are highly infectious, so that the patient should be nursed in a large, airy ward. Here, as a rule, the nurse will wear a gauze over her face.

It should be borne in mind that the mouth and upper respiratory tract are normally a breeding-ground for many varieties of septic and catarrhal organisms.

Febrile patients on a liquid diet tend to get dirty mouths owing to the absence of solid food, which helps to scour the tongue and keep the gums clean. Inhalation of these germs in the debilitated condition of the patient may produce pneumonia. In acute febrile diseases it is, therefore, of the utmost importance to attend to the cleanliness of the mouth. Antiseptic mouth washes and sprays should be frequently employed and always after each feed.

(*c*) *The Kidneys.*—The watery elements of the body are chiefly got rid of by the kidneys, but many salts and organic substances are also excreted along with the fluid. In an average case one or more pints of fluid are eliminated from the body by the skin in twenty-four hours. In cases of fever, therefore, the urine is diminished in quantity, becoming dark and concentrated, producing a red sandy deposit on standing; such a specimen is described as a febrile urine. Germs infecting the body may also make their escape by way of the kidneys. Care should be taken, therefore, in cases of infectious disease, to disinfect the urine before it is thrown away, and the nurse must see that she does not infect herself.

*In some cases the toxin produced by acute febrile diseases affects the gland substance of the kidney, producing actual renal disease. As a rule, this is temporary, but in a small number of cases the condition may become chronic. The severity of the renal condition thus produced varies from the presence of small quantities of albumin in the urine to cases where large quantities of albumin are present with greatly diminished secretion or urine. When fluid cannot leave the body by the kidneys, it collects first in positions where the cellular tissue is loose, such as the area over the sacrum, in the loose folds under the lower eyelids, and also by gravity in the region of the ankles. This condition is spoken of as *œdema* or *dropsy*, and may be recognized by the pitting which remains after pressure by the finger. If the condition persists the serous cavities of the body fill up with fluid. Fluid in the abdomen is called *ascites*. Pleural and pericardial effusions may occur.

(*d*) *The Intestines.*—The main part of the "solid" elements of excretion are got rid of by way of the bowel; and when, along with the normal excretions from the intestines, infected material is eliminated, much additional work is thrown upon the mucous lining of the intestine, and as this becomes congested

by irritation, and subsequently by inflammation, ulcers may form and dire consequences result. In such diseases as typhoid fever and dysentery the ulceration may open a blood-vessel and hæmorrhage ensue, or the ulcer may eat its way completely through the wall of the intestine and allow the contents to escape into the cavity of the abdomen (*see* Fig. 28).

In many infections the disease-products find their way out of the body through not one but all of the excretory organs; but some prefer certain channels of exit to others. Thus, in scarlet fever, in addition to the skin, it is the kidney mostly that is called upon to act; whereas in measles it is the lung, and in typhoid fever the intestine. A knowledge of these facts serves as a guide to the treatment, nursing and diet suitable to the different ailments.

5. **Defervescence.** — When the temperature of the body falls to normal, and continues normal night and morning, the period of feverishness is ended. The poison, however, continues to be eliminated, as in many ailments germs are given off for a considerable period afterwards—that is, during the period of convalescence. A fall of temperature in the morning to normal does not mean that the period of feverishness is finished, for the evening temperature may continue to rise for several days after the morning temperature is normal, or even below normal. It is only when both morning and evening temperatures stand at or below normal that the feverishness can be said to be at an end.

6. **Convalescence.**—Popularly the stage of convalescence is regarded merely as the period of "getting well," but, although feverishness is over, the patient may be still infectious to other people. So much of the infective material (germs, toxins, etc.) has been got rid of that the patient is no longer rendered ill by their presence, but the body is still shedding germs and the patient remains infective.

The duration of the period of convalescence varies according to the disease, but as a broad rule it lasts

for four weeks after the temperature has fallen to the normal. In several ailments, however, as in scarlet fever, the patient is infective for six weeks, and in typhoid fever for two months or much longer (*see* p. 115).

**Table of Convalescent Periods*

Disease.	Convalescent Period.
Scarlet Fever	6 weeks after feverishness has completely subsided.
Diphtheria	4 " " " " " "
Typhus Fever	4 " " " " " "
Plague	4 " " " " " "
Whooping-cough	4 " " " " " "
Measles	3 " " " " " "
German Measles	8 days " " " " "
Mumps	2 weeks " " " " "
Chickenpox (approx.)	When last crusts are away.
Cholera	1 week after diarrhœa has ceased.
Influenza	3 days after temperature is normal.
Typhoid Fever (Enteric)	Indefinite. Two months after fever has subsided is the shortest.

Isolation and Quarantine.—When a case of infective disease occurs in an institution, steps are taken to prevent spread of the infection. In some diseases, such as cerebro-spinal meningitis and diphtheria, bacteriological tests can be carried out to establish the freedom from disease of the "contacts." In other cases it is not possible to recognize the germs, and the suspects have to be kept isolated until the incubation period is over. Many epidemics are started by "*carriers*." These persons may have suffered from the disease in question but have never finally got rid of the germs. A chronic discharging ear following scarlatinal otitis may in this way infect a large number of people before the condition is recognized.

Scarlatina—Scarlet Fever

Scarlatina is the scientific name for scarlet fever; it does not mean that the patient is suffering from a mild form of the disease, as is popularly supposed.

The several stages through which it passes are in accordance with the description given above for the eruptive fevers generally. (1) *Exposure.*—The period at which the disease was "caught" may be known or unknown. The patient may be known to have come into contact either with a person actually suffering from scarlet fever, or with someone in attendance upon, or who had just come from the bedside of, the sufferer, and so the date of infection can be determined. (2) *Incubation* lasts usually three to five, but may extend to seven completed days (i.e. the eighth day). (3) *Invasion* and the *course* of the illness are characterized by the following signs and symptoms: A sudden rise of temperature (*see* Fig. 16); severe feverish symptoms; a sore throat; the tongue becomes coated white, with red spots showing up in the white coating (the "strawberry tongue"); there are enlarged glands beneath the lower jaw; and a characteristic rash. (4) The rash appears on the first or second day of the illness on the neck, chest and face, and rapidly spreads over the body. It begins to fade on the fifth or sixth day, and feverish symptoms decline and disappear about the tenth day. (5) *Defervescence*—that is, the fall of the morning and evening temperature to the normal—occurs rather suddenly, although it is always preceded by a gradual fall. (6) *Convalescence* extends up to six weeks, while the skin of the hands and feet undergoes peeling. During the convalescent stage the patient is highly infectious to other people, and has to be kept isolated or in hospital for the full period of six weeks after the temperature is normal. Desquamation in itself is not infective. Infectivity depends on the presence of discharges from the nose, ear, etc. The *complications* of scarlet fever are nephritis, pneumonia, affection of the ear and rheumatism.

Diphtheria

An acute infectious illness characterized by the formation of false membranes upon the mucous

surfaces of the throat and air-passages with which is associated a profound poisoning affecting in particular the heart and nervous system. Diphtheria must always be regarded seriously, though it is one of the few diseases for which there is definite specific treatment. (1) *Cause.*—The bacillus of Klebs. (2) *Mode of Infection.*—By direct or indirect contact with a clinical case, or through the agency of a "carrier." This term is used to indicate persons who, though quite well, yet harbour the germ in their throat or nose and so are capable of infecting susceptible persons. Rarely, milk has been shown to be a cause of infection. (3) *Incubation.*—The disease may develop in 24 hours after infection, it seldom incubates for a period over 10 days. (4) *Symptoms of Invasion.*—Headache, malaise, extreme lassitude, rapid pulse, a moderate rise of temperature and some degree of sore throat. (5) *Types of Diphtheria.*—The three commonest types are (*a*) faucial, (*b*) laryngeal, (*c*) nasal. Two or more may run concurrently. (6) *Signs.*—*Faucial*: a greyish, or in severe cases a dark-coloured membrane is seen over the tonsils spreading sometimes over the uvula, soft palate and cheeks; it cannot be rubbed off without causing bleeding; there is a characteristic and disagreeable odour. The throat is not painful as a rule. *Other signs*: the glands in the neck enlarge, the patient is languid and drowsy, the temperature is not as high as the rapidity of the pulse might suggest. In severe cases restlessness, vomiting and bruising of the skin occur and are always of grave omen. *Laryngeal*: the infection has invaded the respiratory passages, there is a croupy cough, flushed face, difficult and noisy breathing with drawing in of the lower ribs. In the later stages the patient becomes pale and cyanosed, with dilated and working nostrils, great restlessness and failing pulse. These signs are due to slow suffocation. *Nasal*: there is a discharge from the nose which causes the nostrils and skin of the upper lip to become very sore. This form

not infrequently occurs along with faucial diphtheria. (7) *Complications.*—The greatest danger is sudden heart-failure. Diphtheria poison acts chiefly on the heart-muscle, though it may cause also paralysis of the palate, the eye-muscles, the lower extremities, the diaphragm. In laryngeal cases, apart from suffocation, the danger is pneumonia. (8) *Treatment.*—Essentially diphtheria is an illness requiring careful nursing. The patient must not be allowed to have pillows until the danger of heart-failure has passed; nor allowed to sit up in bed until convalescence is well established. Gargles and local applications to the throat are useless. Diphtheria antitoxin injected in suitable doses and as early as possible is the surest aid; delay in its administration may lead to a fatal issue. (9) *Convalescence* may be very prolonged and depends on the condition of the heart. There is no definite period of infectivity as in most of the acute infectious fevers; the non-infectiveness or otherwise of a patient may be ascertained by taking repeated swabs from the throat and nose and submitting them to bacteriological examination. In recent years the "Schick" test has been devised to ascertain persons who are susceptible to diphtheria; those found so may be in a large measure protected by the injection of a modified antitoxin.

*Variola—Smallpox

(1) The period of *exposure* is usually known, namely, from the patient having come into contact with persons suffering from smallpox. (2) The *incubation period* lasts from 10 to 14 days. (3) *Invasion* is ushered in by a rise of temperature, often attended by a rigor, and followed by marked symptoms of feverishness, usually accompanied by headache and intense pain in the lower part of the back. (4) The *eruption* or rash is in evidence on the third day; beginning on the fore-head and wrists, as small "shotty" particles (like small shot), to be

felt below the skin; the rash is centrifugal. The trunk is relatively free from spots. The areas of irritation, as where the clothes rub, often show aggregation of pustules. The spots in a short time may be felt distributed over the body generally, and even on the mucous membrane of the mouth and nostrils. On the following day the skin over these "shotty" particles is raised into pimples (papules); next day these contain a small quantity of clear fluid (vesicles); the clear fluid in the vesicles becomes thick, and milky in appearance; they are now termed pustules, from the fact that they contain matter or pus; the pustules (or small abscesses) burst, their contents escaping and forming a crust (scabbing stage); finally the scab, with the core or shotty particle attached to it, comes off, leaving behind a small depression (pitting). (Fig. 27.)

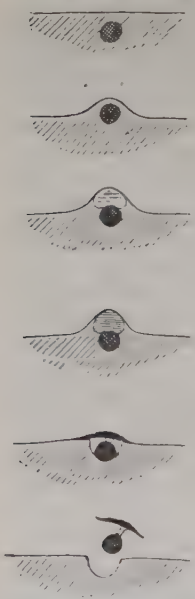


Fig. 27.—Diagram of shedding of "shotty" particles in smallpox.

There are differences and degrees in the virulence of smallpox infection. When the eruption is scanty and widely scattered over the body the smallpox is said to be *discrete*; when, on the other hand, a number of vesicles and pustules are congregated together in clusters it is said to be *confluent*. When,

in confluent smallpox, blood escapes in patches beneath the skin, into the eye sockets (orbits), or from the mucous membrane of the mouth, air-passages, intestines, etc., the disease is said to be *hæmorrhagic* or *malignant* smallpox. The danger to life from confluent smallpox, and more especially from the hæmorrhagic variety, is very great.

The *complications* are pneumonia, and diarrhœa with intestinal hæmorrhage, or the escape of blood with the urine.

In well vaccinated communities smallpox epidemics do not occur.

Varicella—Chickenpox

(1) The period of *exposure* is generally known from the patient having been brought into contact with someone suffering from the disease. (2) The *incubation period* is usually 14 days, but may extend to 18. (3) *Invasion* is ushered in by slight feverish symptoms, gradually increasing in intensity, but seldom severe. (4) The *rash* appears during the first three days after feverishness develops, and begins to fade about the fourth ; it consists of small pimples (papules) of a rose colour, appearing usually on the back, shoulders or chest, and spreading to any part of the body. The rash is thickest on the trunk, most scanty on the limbs, in contra-distinction to that of smallpox. The papules in a few hours have a clear fluid on the top (vesicles) ; these become large, and their contents assume a milky appearance ; they burst, and crusts or scabs form, which fall off, leaving in their place faintly red spots, and sometimes minute pits. Successive crops of vesicles may appear. (5) *Defervescence* occurs in about a week. (6) *Convalescence.* —The patient ceases to be infectious when all the scabs have fallen off.

Measles—Morbilli

(1) *Exposure* may or may not be known. (2) *Incubation* may extend to fourteen days. Signs of a severe cold may be present, the patient complains of a feverish headache, the eyes become red and uncomfortable, and he is seized with coughing and sneezing. (3) *Invasion.*—The temperature suddenly rises, and the patient may become delirious; the signs of a severe cold grow much more pronounced. (4) The *eruption* (rash) appears on the fourth day; it presents spots of a distinct red colour, appearing first on the face and behind the ears, spreading thence downwards over the body and limbs. The spots are slightly raised, and may become grouped into patches, and at its edge the rash frequently presents a crescentic form characteristic of this disease. The spots may appear in two or three successive crops. The rash begins to fade by the seventh day, when the skin assumes a mottled (measly) appearance. (5) *Defervescence* occurs, as a rule, in about eight days from the time of invasion (Fig. 16). (6) The skin may still continue to present a mottled appearance during convalescence, which lasts three weeks. The *complications* are pneumonia, bronchitis, inflammation of the ear and diarrhœa.

German Measles—Rubella

(1) *Exposure* may be known or unknown. (2) The *incubation period* may extend even to three weeks. (3) *Invasion.*—The feverish symptoms are seldom severe; a sore throat is not uncommon. (4) The *rash* occurs on the first or second day. Rose-red spots appear upon the face and extend over the body and limbs, begin to fade on the fourth day, and usually disappear within a week. (5) *Defervescence* takes place, as a rule, within a week. (6) *Convalescence*, one week.

In German measles there is no sign of a severe cold at the onset of the illness, as in ordinary measles.

*Typhus Fever

When human beings are overcrowded in their dwellings, typhus fever is an imminent danger. In gaols and military camps typhus was, in times gone by, a common scourge, so much so that the terms "gaol fever" and "camp fever" were applied to the outbreaks. In private dwellings, also, not only in towns but even in the most isolated country cottages and farm houses, typhus will develop when overcrowding and insanitary conditions prevail. A family of, say, ten or twelve members, or two or more families, sleeping in a single room, dirty and ill-ventilated, will speedily generate typhus. At one time very common in Great Britain, typhus has wellnigh disappeared since about the year 1870—in fact, ever since the excessive overcrowding of private dwellings in towns was prevented. In addition to overcrowding of dwellings, what is known as surface crowding is also a danger. If more than a thousand persons are dwelling upon one acre of ground, the surface crowding is excessive, and if, in addition, there is overcrowding of the rooms in this area, disease will inevitably occur. Typhus fever was very prevalent in Serbia during the late war. Careful research demonstrated that the infection was conveyed by fleas and body lice. When steps were taken to destroy these pests, and movements of members of the community were absolutely prohibited, the epidemics became controlled.

Typhus fever runs through the definite stages characteristic of infectious, eruptive fevers. (1) *Exposure*—to persons suffering from the disease. (2) *Incubation*—fourteen days as a rule. (3) *Invasion.*—The attack is ushered in by a feeling of chilliness and rigor, and the patient speedily becomes very ill, with all the evidences of intense feverishness—headache, foul tongue, high temperature, aches in the limbs, loss of appetite, etc. (4) The *rash* appears on the fifth day on the body, and spreads to the extremities; it presents a number of spots of a

pale-red appearance slightly raised above the skin; these gradually deepen in colour and assume a purplish blue. The name "mulberry" is often given to the rash from the resemblance the spots have to the mulberry. During the second week complications such as pneumonia and heart failure are apt to prove fatal. (5) *Defervescence.*—The feverish symptoms usually disappear within fourteen days, rather suddenly, but may not do so until the twenty-first day. So commonly does the feverishness end on the fourteenth day that typhus was often termed by the laity "fourteen-day fever," to distinguish it from typhoid, which was spoken of as the three-week or four-week fever. (6) *Convalescence*, four weeks.

This is a highly infectious malady, and contagious in a high degree, as evidenced by the frequency with which it is contracted by doctors and nurses attending cases of typhus.

Mumps

Mumps occurs, as a rule, in epidemic form, and is carried directly from one person to another. (1) *Exposure* is usually known. (2) *Incubation* may extend to three weeks. (3) *Invasion.*—The attack is usually ushered in by feverish symptoms, followed frequently in a few hours by pain and swelling in the salivary glands (parotid). The swelling occurs between the back of the lower jaw and the ear in one or both parotid glands; hence the disease is often termed parotitis. The salivary glands below the jaw (the submaxillary) are also at times swollen. As a rule the patient experiences great pain in the affected glands. There is also difficulty in swallowing, and often deafness. (4) There is no skin eruption. (5) *Defervescence* usually occurs in from seven to ten days, but the swelling of the gland may continue after the temperature is normal. (6) *Convalescence*, two weeks. The *complications* are often more serious than the disease itself. Swelling of the testicles,

ovaries and sometimes pancreas may occur, resulting in damage to these various organs.

Whooping-Cough—Pertussis

Whooping-cough as a rule attacks young children in epidemic form. (1) *Exposure* is generally known; one child is believed to communicate the affection to another directly, although it may be occasionally carried in clothing (fomites). (2) *Incubation* may extend to fourteen days or more. (3) *Invasion* is marked by an increase of feverishness and feeling of illness, and there are evidences of catarrh of the respiratory track, with cough. The "whoop" in the cough may come after a few days, or it may be delayed for ten days. It is characteristic of the disease, and is due to spasm in the muscles of the air-passages, causing difficulty in breathing, especially during inspiration. At first the spasms of coughing are severe, lasting for several minutes, and are frequently repeated; the child's strength is severely taxed by the struggle to breathe. (4) There is no rash. (5) *Defervescence.*—The feverishness subsides after ten to twelve days, but the characteristic cough may continue for weeks or months. (6) *Convalescence* lasts four weeks, after which date, although the cough may continue, the child is not infectious to others. *Complications.*—The lungs may become inflamed (pneumonia), and both the digestive and nervous systems may be the seat of trouble for some time afterwards.

Typhoid Fever—Enteric

A thorough knowledge of this illness will greatly help the nurse in her profession. In the course of the disease complications may arise in almost every part of the body. The patient's chance of recovery depends almost entirely on the skill, devotion and knowledge displayed by the nurse.

Typhus and typhoid fever have only been distinguished as separate diseases within recent times.

The word typhoid means "resembling typhus," the termination "oid" being derived from a Greek word signifying "like," The disease is also known as *enteric* fever, from the fact that the part of the body that typhoid manifestly attacks is the small intestine, known to the Greeks as the *enteron*. In many countries the disease is known as *abdominal typhus*, meaning thereby a typhus-like disease which attacks an organ of the abdomen. The old term *gastric fever*, used in this country, pointed in the same direction. Typhoid fever may be spread from person to person by uncleanliness owing to the germs of the disease being in the urine and fæces of a sick person. Occasionally, a person who has been ill with typhoid fever discharges the typhoid germs for weeks, months or years when quite well; such persons are called "typhoid carriers." The disease is also caused by the typhoid germ getting into water or milk, or by infected dust contaminating food.

In recent years the important part played by house-flies in the spread of this disease has been fully recognized. In military camps where sanitation is perfectly carried out and where flies are absent, there will be no typhoid fever, even although "carriers" may be present.

Bacteriological examination has shown that several varieties of typhoid fever exist, the commonest being known as *paratyphoid fever*. Both typhoid and paratyphoid fevers, which tend to break out when large numbers of troops are collected, can be now prevented by administration of anti-typhoid vaccine. In the Great War there were far fewer cases of typhoid than in the South African campaign, when an infinitely smaller number of troops were employed. All persons going to the tropics should have a preliminary dose of vaccine ("T.A.B.").

(1) Only by proof that an infected food or drink has been consumed can the period of *exposure* be known. (2) The *incubation period* is usually fourteen

days, but it may be from seven to twenty-one days or longer; there need be no symptoms of illness during this stage. (3) *Invasion.*—The feeling of illness is sudden, but the rise of temperature is at first slight; day by day the temperature gains slowly (Fig. 15), rising as a rule in the evening a couple of degrees above that reached on the previous morning; it drops on the following morning by about one, to rise two again on the succeeding evening; and so on from day to day for seven or eight days, till it reaches the maximum, often 104 or over, about the end of the first week. During the second week a high level of temperature is maintained until towards the end of the week it begins to decline, and the fall continues gradually (i.e. by lysis) during the third and fourth weeks until it reaches normal. Delirium is a common feature during the first few days after the onset, and may continue in severe cases for a week or more; diarrhœa is usually present, the motions passed being like pea-soup, hence the phrase "pea-soup" stools. The most marked evidence of the disease is met with in the intestines, where certain spots (Peyer's patches) on the lower part of the small intestine become ulcerated. (4) The *rash* appears on the eighth or ninth day—that is, at the beginning of the second week of illness—as reddish spots over the upper part of the abdomen and round the waist; on the other hand, there may be no rash. The spots vary in number from two or three to several dozens; the rash never spreads to other parts of the body. (5) *Defervescence.*—The temperature gradually falls if no complication has occurred, and in favourable cases after the twenty-eighth day of the disease—or even as early as the twenty-first—the evening as well as the morning reading of the clinical thermometer may become normal and may remain so. (6) *Convalescence.*—Two months, but, as mentioned above (p. 114), a person who has had typhoid may continue to be a carrier for several years.

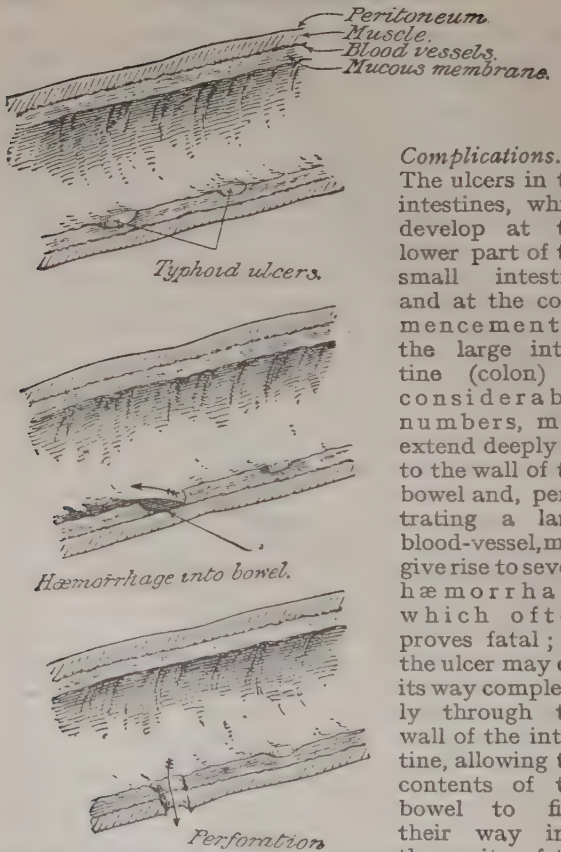


Fig. 28.—Diagram showing structure of intestine (which is laid open), the presence of typhoid ulcers, and the occurrence (1) of hæmorrhage, (2) of perforation at the seat of ulceration. (*See* text.)

Complications. — The ulcers in the intestines, which develop at the lower part of the small intestine and at the commencement of the large intestine (colon) in considerable numbers, may extend deeply into the wall of the bowel and, penetrating a large blood-vessel, may give rise to severe hæmorrhage which often proves fatal; or the ulcer may eat its way completely through the wall of the intestine, allowing the contents of the bowel to find their way into the cavity of the peritoneum and causing general and frequently fatal peritonitis (*see* Fig. 28). A

sudden and marked drop (i.e. by crisis) in the patient's temperature in the course of typhoid fever usually indicates the occurrence either of hæmorrhage or of perforation of the intestine. The importance of careful feeding, on account of the danger likely to ensue from irritation of these ulcers, has been already pointed out. The lungs also may become inflamed (pneumonia), and this, too, may prove to be a very dangerous complication.

Plague

* There are various centres of plague in the world where the disease is endemic, but at long intervals it spreads thence and becomes epidemic in the districts around, or even pandemic—that is, universally spread over many lands. The disease is caused by a bacillus conveyed to man by the fleas of rats, marmots, and squirrels afflicted with the disease. The principal varieties of plague are the bubonic and the pneumonic.

* **Bubonic Plague.**—(1) *Exposure* is not known as a rule, the disease not being carried directly from man to man. (2) *Incubation* extends to five days, during which time no symptoms are observable. (3) *Invasion.*—The patient is suddenly taken ill with feverish signs, and a mild or severe delirium soon develops. Buboes (a bubo is simply a swollen gland) appear in the groin, the armpits, or the neck, as a rule on the first or second day of the illness, and speedily assume large dimensions—as big as Bath buns, it may be. The temperature keeps high, and the patient usually dies on the third or fifth day. Should the fifth day be survived, some of the buboes break down and form abscesses, which burst; if the tenth day passes the patient has a chance of recovering. (4) A blotchy *rash* may appear on the skin, or boils may form. (5) *Defervescence* is variable, the feverishness sometimes subsiding in a week, or after the abscesses have burst.

(6) *Convalescence* is slow, but the patient is not directly infectious.

***Pneumonic plague** is caused by the same bacillus, but it is the lungs that become the chief seat of the disease; the inflammation is so acute and the infection so extreme that the patient, as a rule, dies on the third day, but life may be prolonged to the fifth day, or even a little longer. Persons suffering from pneumonic plague infect other people brought into contact with them. Should any of the mucus coughed up fall upon the mucous membrane of the eye, the mouth or the nostrils of doctor or nurse, infection (contagion) is almost certain to follow.

*Cholera

What is known as Asiatic cholera is endemic in certain parts of Asia, especially in India. Not infrequently it becomes epidemic, and at times pandemic. It is due to a bacillus—the cholera bacillus—getting into the food, especially the water supply, which is contaminated by the excreta of persons suffering from the disease. (1) *Exposure* is only known when the germ causing it has been proved to exist in the drinking water. (2) *Incubation* varies from a few hours to a few days—it may be as much as five days. There are no symptoms during incubation. (3) *Invasion* begins with diarrhœa, which speedily develops into violent purging accompanied by vomiting. The stools are copious, and present the appearance of water in which rice has been boiled, hence the term "rice-water stools"; exhaustion and great prostration supervene; the patient's skin becomes shrunken and wrinkled; the pulse fails, and the last stage may speedily be reached—collapse. At the beginning of an epidemic the majority of persons attacked die, but as the epidemic wanes recovery is more frequent. *Convalescence* extends over a long peroid.

In both plague and cholera preventive vaccines are the means of diminishing risk of infection.

*Cerebro–Spinal Meningitis

A brief mention of this disease is necessary, since it appears to be on the increase in this country. A large number of cases occurred in the late War.

The disease is due to a specific organism which enters the cerebro-spinal system through the nose. Overcrowding is an important factor in its production. *Incubation.*—The time is not definitely known, probably four or five days. The patient becomes suddenly ill with vomiting, temperature and severe headache. He rapidly becomes unconscious, develops a squint, and signs of cerebral irritation. The back of the neck is stiff, and he passes his water under him. A fine red rash may develop on the abdomen. A large number of the cases succumb. Those who survive are often left in a mentally feeble condition. The treatment, apart from nursing, consists in lumbar puncture and injection of serum into the spinal canal. When the patient is unable to swallow, a small tube is passed to the back of the throat, through the nose. The feed is introduced carefully by a funnel attached to this tube. This is known as " nasal feeding."

*Tetanus—Lockjaw

The bacteria of tetanus are present in the soil, and only grow in the absence of oxygen. All dirty punctured wounds may therefore be complicated by this infection. The risk is eliminated by the administration of 50c units of anti-tetanic serum (A.T.S.). In cases where serum has been given a note must be made on the patient's records and the doctor told. The reason for this is that the body becomes sensitive, and, if given a second dose at the wrong interval, the patient may suddenly die from poisoning (anaphylaxis).

Ten days after any serum is given the patient may be seized with pains in the joints, and a nettle rash. This condition usually passes off in a day or two.

In an established case of tetanus the patient presents firm contractions of all the muscles. The teeth are clenched, the head is held back and the spine is arched. The slightest noise or movement will throw him into a general spasm. To relax the spasm an anæsthetic may be required. Feeding is carried out by means of a nasal tube. Some cases recover after large doses of serum have been injected into the spinal canal.

*Gas Gangrene

This is another disease due to a germ which only grows in the absence of oxygen (anaerobic). The organism flourishes in heavily manured soil and grows in dead muscle. When, therefore, infected mud is carried deeply into a wound, these germs flourish and produce their symptoms. In a few hours the patient becomes very ill, with a flushed face, high temperature and rapid pulse. The wound is foul and the affected muscles become blown out with gas. The smell is characteristic and may be detected a long way off. Unless surgical interference is promptly carried out the patient rapidly sinks, becomes pale and grey, and dies in a collapsed condition.

*Encephalitis Lethargica

Definition.—This rare condition, to which popular attention has recently been drawn, is a disease of the central nervous system, produced by an infective agent whose nature is not yet fully worked out.

Predisposing Causes.—It may occur as a complication of influenza, measles, and very rarely after vaccination for smallpox. This happens about once in 50,000 cases and practically never in vaccination in infancy.

Symptoms and Course of the Disease.—The chief symptom is drowsiness, accompanied by a moderate degree of fever, and probably irregular paralysis of one or more limbs. The acute stage is very apt to

end fatally. If the patient survives he only convalesces after weeks or months of illness. Complete recovery is uncommon.

The patient generally becomes either mentally deficient or otherwise a helpless invalid.

Treatment.—No specific treatment is known. The usual nursing details must be attended to, and suitable precautions taken to prevent the spread of the disease.

Erysipelas

Definition.—Erysipelas is a specific contagious disease due to a peculiar form of streptococcal infection of the skin accompanied by a general toxæmia.

Predisposing Causes.—The organism gains entry through some breech of surface, such as a small scratch on the cheek, and develops in sufficient numbers to produce symptoms in those patients whose vitality is lowered.

Symptoms and Course of the Disease.—The patient complains of a localized painful swelling, which presents all the signs of inflammation. The hard edge of the swelling is characteristic.

The patient shows all the usual signs of toxæmia, and is very ill.

In favourable cases the inflammation clears up without suppuration in the course of a few days. In the other cases, septicæmia, pneumonia, heart-failure and other complications lead to a fatal issue. Erysipelas is always a serious disease and is often fatal in old people.

Treatment.—Erysipelas is one of the notifiable infectious diseases, and strict isolation must be enforced.

There is no specific treatment at present. General attention to nursing details and regular feeding must be carried out.

The condition is treated locally by whatever applications are ordered by the doctor.

Influenza

Influenza is the name given to an acute infectious disease which generally produces catarrh of the respiratory tract and which spreads very rapidly in a widely epidemic form.

Cause.—Although various germs have been described as the causative agent, the exact cause of the disease is still a matter of doubt. The disease is frequently complicated by the presence of several organisms, producing fatal complications.

Symptoms.—Several types of the disease may be recognized: (*a*) The simple febrile type, where sudden fever is accompanied by headache, muscular pains and prostration. (*b*) The respiratory type varies greatly in different epidemics and may be accompanied by lung complications, as pneumonia. (*c*) The abdominal type, accompanied by vomiting, pain and diarrhœa. (*d*) The cerebral type may produce profound disturbance of the nervous system, difficult to distinguish from meningitis or encephalitis.

Course of the Disease.—In most cases the illness is brief and ends favourably. In some epidemics lung complications may be very common and the mortality is high.

Inflammation of the middle ear with its train of complications must be watched for.

Treatment.—Preventative measures, i.e. attention to general hygiene, and perhaps prophylactic inoculations are useful.

Isolation should be attempted in all cases and as early as possible.

Apart from general nursing routine, symptoms should be treated as they arise. Insomnia is often troublesome, and heart trouble may follow if too vigorous exertion is allowed too soon.

CHAPTER XV

DISINFECTANTS AND DISINFECTION

A DISINFECTANT is an agent capable of destroying the organisms (microbes, micro-organisms, germs, bacteria, etc.) with which it is brought into contact. "Bactericide" and "germicide" have the same meaning as disinfectant.

An *antiseptic* has the power of hindering or staying the growth of organisms and of preventing decomposition.

A *deodorant* serves merely to mask or absorb the effluvia which emanate from bacterial growth or are evolved during decomposition.

Of the many disinfectants and antiseptics, the best known are :—

Heat. (i) *Burning.*—Articles of small value, such as dressings, swabs, etc., may be burnt in the fire in the sick-room ; these, as well as any material used to mop up discharges from mouth or nose, should be placed on the fire immediately, that is, before the secretions upon them become dry. If in camp, cholera, dysenteric and enteric stools should be mixed with sawdust, saturated with paraffin and burnt in the incinerator. (*See* B. R. C. S. Manual No. 4.)

(ii) *Boiling* for twenty minutes is a convenient method of sterilizing instruments, crockery, glass, bed-room utensils, bed and body linen, and of preparing towels and receptacles for the operation table, etc. If blood, fæces, or foul discharges have stained linen or cotton material, the stained portions should be soaked and rubbed off in cold salt water before the materials are boiled, otherwise the stains become fixed.

(iii) *Dry Heat.*—This is no longer used. The

temperature required to kill germs is so high that materials and fabrics are ruined. A hot-air method of killing lice was extensively employed in France. (Orr's " De-louser.")

(iv) *Steam.*—Bulky articles such as mattresses, pillows, blankets and clothing are more rapidly and completely disinfected by steam than by dry heat. The steam, when generated, is passed into the disinfecting chamber without pressure at a temperature of 212° Fahr., or under a low pressure giving a temperature of 230°, or at a high-pressure temperature of 240° to 248°. These temperatures are obtainable by machines of various designs, which may be stationary (as at disinfecting stations), or portable and moved about from village to village, or house to house. The principle of their working is that of exposing the articles within cylinders to either saturated or superheated steam, by either of which methods the disinfected materials emerge quite dry.

Steam sterilizing is now universally employed in preparing dressings, swabs, overalls, towels, rubber gloves, etc., required for surgical operations. (Further details will be given in the chapter on the Operating Theatre, p. 144.)

Liquid Disinfectants.—A large number of liquid disinfectants are now available. For practical purposes it is only necessary to keep a supply of one or two. Expense should be considered when making a choice.

Lysol.—The first antiseptic introduced by Lord Lister (carbolic acid) has now been superseded by many others, such as lysol, etc. Lysol may be used undiluted for sterilizing knives, scissors, needles, etc., for use before operations. For use as an antiseptic lotion for swabbing down walls, rinsing bowls, etc., a dilution of one teaspoonful of lysol to a pint or more of warm water is used.

Methylated Spirit.—This should be diluted with water to contain 75 per cent. of alcohol. It is the

second antiseptic necessary. This is used for rinsing off the pure lysol from knives, scissors, etc. Some surgeons rely on spirit alone to sterilize their cutting instruments. Spirit, too, is useful to sterilize the skin in the final preparation for operations. Pure methylated spirit has the additional advantage of being inflammable. Bowls or even instruments may be efficiently sterilized by setting fire to a suitable quantity of spirit (flaming).

Of the other disinfectants in common use, perchloride of mercury (corrosive sublimate), biniodide of mercury, potassium permanganate (Condy's fluid), izal, etc., may be mentioned.

There are many popular antiseptics at the present time derived from dyes of a brilliant hue, such as brilliant green, flavine, etc.

Gaseous Disinfectants.—Burning sulphur is now replaced by the use of *formalin* (Fig. 29).

Chlorine is a useful disinfectant. The gas is given off from chloride of lime (bleaching powder).

Eusol solution is a lotion from which chlorine is liberated when in contact with damaged tissues.

Hydrogen peroxide lotion is also a solution from which nascent oxygen is freed in minute bubbles when the lotion comes into contact with septic material.

Disinfection of a Sick Room

1. **Before Occupation.**—It is impossible to destroy all the germs present by the application of any chemical disinfectant, no matter how powerful. The room should be prepared as described in Chapter III. If rooms or buildings have to be adapted for hospitals the best results will be obtained by applying the principles of ordinary cleanliness, as far as time permits. Soap and water, fresh air and sunlight will do more to kill germs than any other method.

2. **During Occupation.**—Here, again, especially in dealing with infectious disease, the value of fresh air and sunlight cannot be emphasized too strongly.

The feeding utensils, etc., in use by the patient should be kept apart and washed in lysol solution after use. Articles such as books, papers, toys, etc., are generally burnt when the illness is at an end. Bed-pans and urine bottles from infectious cases are emptied into a special closet and rinsed with antiseptic and flushed copiously with water after use.

3. **After Occupation.**—Before the patient changes his room for another, if the ailment has been of an infectious nature he should be washed all over with a disinfectant, or given a bath in the room, if this be possible. After the bath and rubbing down with a towel, he is wrapped in a blanket or dressing-gown and taken to the room prepared for him, where he puts on fresh night-gear or underclothing. When the patient, after having passed through an infectious illness, leaves the room, nothing is to be removed except such materials as night garments, sheets, pillow cases and towels, which are to be collected and placed in the 1 in 40 lysol solution in the jar or tub at the door of the room. The blankets are to be taken one by one and thrown over the head or end of the bed, or upon the open door of a wardrobe, or on a clothes-horse, or arranged in any other way so that the disinfectant gas to be used can reach both sides of them ; rugs are thrown over a chair, not left on the floor ; the mattress is to be set on its edge on the bed or floor for the same reason ; the wardrobe or cupboard doors are to be opened ; all drawers should be taken out of the chest, wardrobe, basin-stand, etc., and stood up against the wall all round the room ; the window is now shut and latched, and pieces of paper pasted over any place on the sill or around the frame where air might enter. The register of the grate is closed, or the mouth of the chimney stopped up with paper, canvas or straw, so that there is no current of air up or down the chimney.

Since disinfection is more successful when the atmosphere is damp, it is advisable to sprinkle water

over the floor and walls. The room, too, must be warmed and kept at a temperature of between 50° and 70° Fahr.

A formalin fumigator, such as Lister's Formaldehyde Fumigator, is advised, (Fig. 29). This apparatus is made in three sizes to suit the cubic capacity of the room. The fumigator is placed on a fireproof plate lighted as directed and left in the room for at least four hours — preferably all night. It is then entered, aired, and is ready for use again.

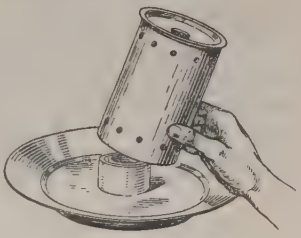


Fig. 29.—Lister's formaldehyde fumigator.

This method now replaces the older plan of burning sulphur to disinfect a room.

CHAPTER XVI

SURGICAL INSTRUMENTS AND APPLIANCES

A THEATRE NURSE is usually held responsible for seeing—(1) that the surgeon's instruments are in good order; (2) that faulty instruments are repaired; (3) that the instruments are sterilized for the surgeon's use; (4) that trays, basins, etc., are at hand for instru-

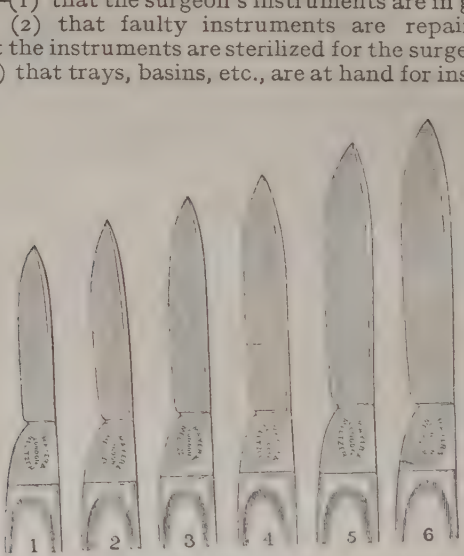


Fig. 30.—Scalpels.

ments, swabs, and dressings; (5) that antiseptic solutions are ready for immediate use; and (6) that the table is prepared for operation. The nurse ought to know the instruments by their technical names, and to understand the mechanism of complicated instruments, so as to take them to pieces for the purpose of cleaning and sterilizing them.

Cutting Instruments.—Surgical knives are named according to the use to which they are put. A *scalpel* (Fig. 30) is a short knife with a convex cutting edge and a straight back, used to open abscesses, to incise the skin, etc. A *bistoury* is a long, narrow knife, the cutting edge being parallel, except near the tip, to the back of the knife ; its point may be sharp or blunted. A *sharp-pointed* bistoury is used for operations especially upon the fingers and toes, and the *blunt-pointed* is made to run along a director when deeply seated tissues are being cut. A *curved* bistoury, as its name implies, is curved in the blade and tapers to a sharp point ; it is mostly used for opening abscesses.

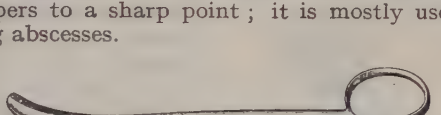


Fig. 31.—Surgical scissors "curved on the flat."

Amputation knives are stout knives with long blades, having a convex cutting edge and a sharp point.

Surgical Scissors.—During operations the surgeon most commonly uses a pair of straight scissors 5 or 7 inches long. At least two pairs will be required for each operation. Curved or angular scissors are sometimes useful. (Fig. 31).

All cutting instruments should be carefully washed, dried and cleaned after use. Any stains should be removed with one of the many metal polishes now available, or whitening moistened with methylated spirit. The sharpening of scalpels should usually be left to an expert, and is necessary after each operation.

To sterilize before use, the cutting instruments are placed in a tray containing pure lysol, for at least fifteen minutes, and later transferred to

methylated spirit. Before use they must be rinsed in sterile water or saline solution. In bone operations the surgeon will use saws, chisels, gouges, and trephines and periosteal elevators, etc. These are sterilized by boiling. A *trephine* (Fig. 32) is a small circular saw for cutting out a disc of bone, generally from the skull. The trephine is rotated by hand or by an electric motor. The disc of bone when cut is lifted out by a special elevator.

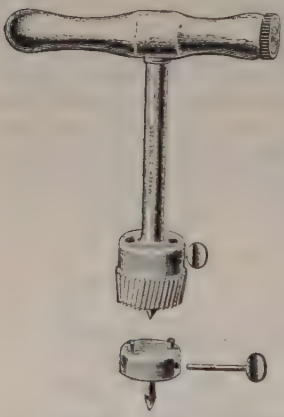


Fig. 32.—Trephine.

Saws.—Surgical saws are narrow and short, or broad and of good length, according as they are required for sawing large or small bones. A movable-backed saw is one in which the back of the instrument can be raised by a movable attachment so

Fig. 33.—Dissecting forceps.

that the blade of the saw can sink more deeply without increasing its dimensions. Hey's saw consists of a long handle of metal, at one end of which is a flat piece of metal presenting a sawing edge about 1 in. in length. It is intended for operations on the skull.

Forceps.—*Dissecting forceps* are in shape something like ordinary pincers; the inside of the points

is roughened so that the tissues may be grasped (Fig. 33). Two pairs of dissecting forceps should be put out for each major operation. In suturing the skin a 7-inch pair of toothed dissecting forceps is useful. *Cheatle's forceps* are used for picking up bowls, removing single instruments from the steri-

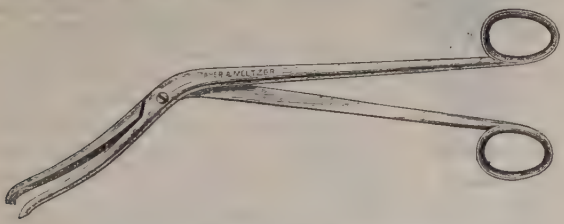


Fig. 34.—Cheatle's instrument forceps.

lizer, etc. When not in use they are kept in a tall glass vessel containing lysol or methylated spirit, their handles protruding. (Fig. 34.) *Bone forceps* (Fig. 35) must be prepared for use in bone operations, amputations, etc. *Tongue forceps* have scissor

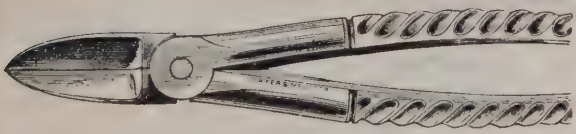


Fig. 35.—Bone forceps.

handles and ring-shaped or oval blades for seizing the tongue should there be difficulty of breathing during anæsthesia. They are not to be confused with the tongue depressor (Fig. 36). The introduction of *artery forceps* (*hæmostats*), commonly called " pressure forceps " or " Spencer Wells," produced an enormous advance in the technique of operative

surgery. They were introduced about seventy years ago by Sir Spencer Wells, an eminent English surgeon. The handles are made to catch, and the blades are short, being roughened or toothed. A bleeding vessel, as it is exposed in the wound, is seized with a pair of these forceps, which are left in position until the final stages of the operation, when the mouth of the vessel is closed by twisting of the forceps or by tying the point with a ligature. The forceps are made in various sizes. In a big operation, as on the neck, or breast, three or four dozen 5-inch Spencer Wells will be required, and one or two dozen 8-inch. The nurse who is called on to assist during the operation should practise taking off Spencer Wells forceps with either hand. (Fig. 37.) *Lane's tissue forceps* are used for clipping gauze or towels to the edge of the wound to prevent exposure of the skin in the operation area. The weight of these forceps will keep the edges of the wound apart so that the old-fashioned retractors will seldom be required. (Fig. 38.)

Fig. 36.—Tongue depressor in use.

Fig. 37.—Artery forceps.

Instruments Used in doing Dressings. *Probe.*—Indiscriminate use of probes should be avoided,

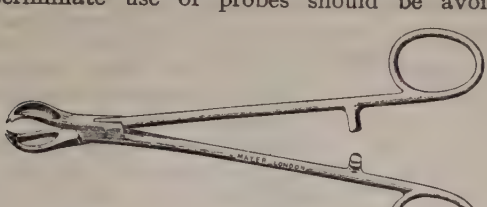


Fig. 38.—Lane's tissue forceps.

especially in the examination of a recent wound, since, by the passage of the probe, dirt, fragments

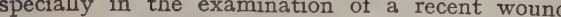


Fig. 39.—Probe.

of clothing, etc., may be carried into the depths of the wound, causing harm. A probe may occasionally

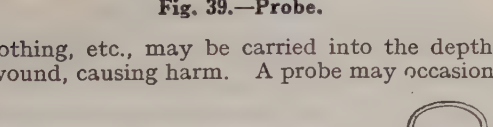


Fig. 40.—Sinus forceps.

be useful in packing in strips of gauze in a small wound. (Fig. 39.)

Sinus forceps. — The sinus forceps resembles a pair of pressure forceps but has no catch. This instrument is used for packing sinuses, etc. (Fig. 40.)

Fig. 41.—Surgical needle.

Surgical Needles are divided into two classes—(1) round-bodied, (2) cutting. The former may be straight, half curved or fully curved, and resemble the ordinary needle in common domestic use. These needles are used for sewing soft tissues, such as fascia, intestine, etc.

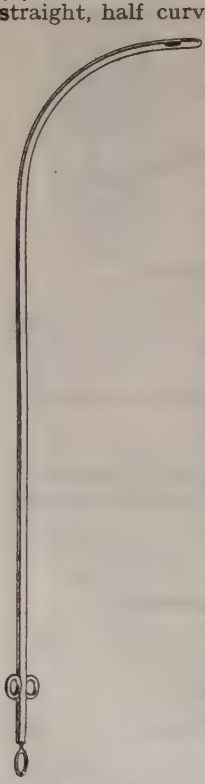


Fig. 42.—Silver catheter.

Cutting needles, as their name implies, possess, in addition to a sharp point, a cutting edge which enables the needle to pass readily through tough structures, such as the skin. These needles are either straight or curved. (Fig. 41.)

Aneurysm Needle.—An aneurysm needle is a curved, blunt-pointed needle mounted on a handle. The instrument is designed to convey a thread round a blood-vessel.

Needle-holder.—In sewing small structures, such as blood-vessels, or structures in the depth of a wound, some form of needle-holder is necessary. A separate instrument is not essential; a suitable pair of Spencer Wells forceps can be substituted.

Catheters.—A catheter consists of a small tube made of metal, rubber, gum-elastic, or glass. The commonest use for catheters is to draw off the contents of the bladder. In the male a rubber or gum-elastic catheter is generally used. These must be kept clean and are sterilized before use by being boiled for one or two minutes. The stylet of a metal or gum-elastic catheter is only removed after the instru-

ment has been introduced. A metal catheter is shown in Fig. 42. In the female a rubber or short glass catheter is used.

The operation of catheterization must always be carried out under conditions of the strictest surgical cleanliness. Necessary instruments are sterilized before use and placed so as to be within easy reach of the operator. Lubricating fluid (sterilized oil or paraffin) is put ready with the cover of its containing vessel removed. A sterile towel is placed in position and the parts surrounding the opening of the urethra (urinary meatus) are cleansed with soap and water. The operator then washes his hands thoroughly. A second cleansing of the urinary meatus is now carried out by swabbing with a pledget of sterile cotton-wool soaked in saline or boracic acid lotion.

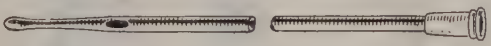


Fig. 43.—Gum-elastic catheter, probe-pointed.

The catheter is picked up and not allowed to touch anything that is not sterile. When the urine is drawn off, the catheter is removed, washed, dried and put away for subsequent use. Catheters are graded in sizes 1 to 12. Size 10 is useful for general use. Fig. 43 illustrates a type of gum-elastic

Fig. 44.—Rubber catheter.

catheter, Fig. 44 the common rubber catheter in general use.

Bougies are made of solid metal or gum-elastic. They are prepared for use in the same way as catheters. Bougies are made in different shapes and sizes and, may be used for passing into passages, such as the urethra, the œsophagus, or sometimes the rectum.

Trocar and Cannula.—The trocar is a metal rod

with a sharp point mounted on a stout handle. The cannula fits over the trocar so that the point is protruding. This instrument is used for puncturing the body to remove a collection of fluid. When the cavity containing fluid is reached, the trocar is removed, leaving the cannula, through which the

Fig. 45.—Potain's aspirator.

fluid escapes. Removal of fluid from the peritoneal cavity by this means is called paracentesis abdominis.

In a case of ascites (fluid in the peritoneum) several gallons of serum may be removed.

**Aspirator* (*Potain's*) (Fig. 45).—Removal of fluid from the chest (paracentecis thoracis) has to be carried out by suction. This is done by means of the aspirator, which consists of a large bottle with an india-rubber cork, to which are fitted two tubes

having taps and passing through the cork. One leads to the aspiration pump, the other to the needle introduced into the chest. A vacuum is produced in the bottle and the pump tap turned off. Turning

Fig. 46.—Enema syringe.

on the chest tap will now cause the fluid from the chest to run into the bottle. Since the nurse has to manipulate this instrument while the surgeon introduces the needle, it is necessary for her to become thoroughly familiar with the work of the apparatus.

Syringes are made of glass, of vulcanite and glass,

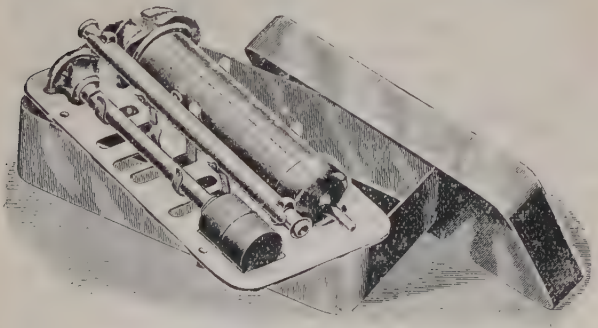


Fig. 47.—" Record " hypodermic syringe.

or of metal; they are used for washing out wounds, ears, etc.

Enema Syringe.—The most common enema syringe in use is Higginson's (Fig. 46). It consists of a long piece of rubber with a bulb about the centre of the

tube; at one end is a piece of metal containing a valve, which is inserted in the fluid to be injected. At the other end is a nozzle, usually of vulcanite, about 3 inches long, with a shield at one end and a rounded point at the other; the point, when vaselined, is introduced into the bowel, and gently pushed on as far as the shield; or an india-rubber catheter may be fastened to the nozzle of the syringe and slowly introduced. By repeated compression of the bulb the fluid is introduced. When a pint of soapy water (simple enema) has been given, the patient is instructed to retain the fluid in the bowel for three to five minutes. After this time he will usually return the fluid together with a stool.

The *hypodermic syringe* (Fig. 47) is used to inject medicinal fluids beneath the skin. It consists of a barrel, a plunger or piston, and a hollow needle. The material of which it is made (except the needle) may be all glass, all metal, or a combination of glass and metal. Hypodermic syringes are marked, usually, from 5 to 20, to indicate the number of minims (drops) the syringe holds. In the channel of the needle a fine wire should always be kept when not in use, so as to prevent the needle from getting blocked by corrosion. It is well to dip the wire in vaseline before inserting it into the needle. The best type of hypodermic syringe is a 20-minim Record syringe.

Fig. 48.—Tracheotomy tube.

Tracheotomy Instruments.—The nurse should be familiar with tracheotomy instruments, since this operation has often to be done in a hurry. The essentials are a knife, tracheotomy tube and tracheal dilator. The *tracheotomy tube* (Fig. 48) consists of an outer and an inner tube of metal. The outer tube presents a shield at one end with two apertures, one on either side, intended for the passage of tapes by which the instrument is maintained in place; below the shield the tube is split so as to form two

lateral valve-like pieces capable of being compressed or distended. The inner tube is rounded, and when passed into the outer is seen to be the longer. It presents at one end two small handles by which it can be pushed in and out. The instrument is introduced after the windpipe (trachea) has been opened in the neck to allow the patient to breathe when air cannot enter through the natural passages, as occurs in diphtheria and other ailments, and when the larynx is obstructed by a scald of the throat. The inner tube can be removed from time to time and cleansed, and again inserted. In order to clear mucus from the tube a supply of sterile feathers should be at hand.

Drainage tubes are not now used so extensively as they used to be, but may in some cases be employed after operations. They are made of india-rubber of different sizes, with holes cut in them here and there to allow of better drainage; glass drainage-tubes are sometimes used for the abdomen.

Ligatures.—When large-sized blood-vessels are cut during an operation their mouths are seized by artery forceps (Spencer Wells pressure forceps, p. 131), and the vessel is subsequently tied with catgut, silk or thread. The catgut is supplied of different sizes and is sterilized ready for use. The silk or thread is sterilized by the nurse or surgeon immediately before the operation by boiling for twenty minutes. When buried in the tissues catgut is absorbed; it may be in a few days, or in a few weeks. Silk and thread remain permanently in the wound, and, if efficiently sterilized, give rise to no disturbance.

Sutures.—The skin edges of wounds are closed by stitching with catgut, silk, silkworm-gut, horsehair, ordinary linen thread. With the exception of catgut, which becomes dissolved, they are removed at a subsequent date, that is to say, the sutures are cut with scissors and then removed by forceps. Buried sutures are sutures that are applied deeply in the

wound and the edges closed over them. Silver wire, screws, pegs, metal plates, etc., are used in bone operations.

Truss.—A truss is a device for restraining ruptures (hernias). A ruptured patient must never be allowed up unless protected by his truss, or the hernia may become "strangulated."

Stethoscope.—The doctor uses stethoscopes of various patterns to listen to the sounds of the chest. It may consist of a hollow stem of wood with a large disc at one end to which the doctor applies his ear, or of a mechanism of two jointed hollow steel tubes, with two knobs at one end which fit into his ears: this latter instrument is known as the binaural stethoscope.

CHAPTER XVII

SUBSTANCES USED IN DRESSING WOUNDS

Surgical Dressings.—The essentials required for surgical dressings are (1) a suitable absorptive material which can be easily sterilized, (2) a material which is not too hot, heavy and uncomfortable for the patient, (3) something not too costly.

A clean stitched surgical wound is not covered at all by some surgeons. Under these conditions clean pyjamas alone are used in cases of abdominal wounds. A patient is, however, more comfortable when a suitable dressing is applied. In the case of face wounds, the incision, which rapidly becomes sealed by the serum of the body, is left entirely exposed.

Antiseptic dressings, that is, materials impregnated with chemical antiseptics, are no longer used, with the exception of boric lint (used for fomentations) and picric lint (for burns).

Cotton-wool.—Surgical or absorbent cotton-wool is specially prepared and is readily sterilized. It is usually applied over gauze. For splints and other dressings in hospital practice, a cheaper unbleached wool may be used.

Gauze.—Cotton gauze is now in general use as an immediate dressing for wounds. Cut into suitable lengths, it forms the best material for "swabs" used by the surgeon to keep the wound dry when operating. A roll of gauze forms at the same time both a suitable dressing and bandage in some cases, such as wounds of the neck, scalp, etc. Cellulose or wood-wool is cheap and useful as an outer dressing.

Gamgee tissue consists of large sheets of absorbent wool enclosed between two layers of gauze; it may

be cut into squares or any other convenient shape, and laid over the dressing on a wound, or the cut squares may be tied up into pads or swabs (artificial sponges). Tapes may be sewn to a sheet of gamgee tissue of suitable size to form a " pneumonia jacket " especially useful in children.

Lint.—Surgical lint cloth is a cotton material specially woven ; it presents two sides, one soft and fluffy, the other smooth. It is usually applied double, the soft side being inwards so that the smooth surface comes in contact with the wound. The fluffy side of the lint should not be applied next a wound, as the fluff irritates its surface. Lint is sterilized by boiling, or in a steam sterilizer ; or, in an emergency, a single sheet may be held before the fire until scorching begins, when it may at once be applied as a dry aseptic dressing. Lint may be used plain, or impregnated with boric acid (and coloured pink), when it has merely to be dipped in sterilized water and applied as a dressing.

Peat moss (sphagnum), prepared and sterilized and supplied in masses as a compressed sheet, is endowed with great absorbent qualities, and is specially adapted as a dressing for foul wounds. This is economical, and was extensively used in the Great War.

Impervious Dressings.—To prevent the lotion contained in lint, cotton-wool, etc., from being absorbed by the bandage applied to retain the dressing of a wound in position, it is necessary to interpose a piece of non-absorbent material between the dressing and the bandage. The best known of these are oiled silk, gutta-percha tissue, jaconet, mackintosh, and prepared oiled paper. It is necessary to cut the impervious dressing a little larger than the application it covers, but care should be taken that it does not extend too far, say more than half an inch, beyond the edges of the dressing, otherwise the impervious material is apt to cause irritation and bring out a crop of pimples where it touches the

skin. Unless the "surface" of the impervious material is destroyed by the nature of the lotion it comes in contact with, or by the discharges from the wound, it may be wiped or washed clean and used again.

Emergency Dressings.—In a street accident or emergency when ordinary dressings are not available, a clean handkerchief, or a piece of material torn from a shirt or other article of clothing, may be used to cover a wound as a first-aid measure. The parts will be covered and bleeding checked until proper attention can be given.

In the British Army each soldier on Active Service carries what is known as a "First Field Dressing." A larger dressing known as a Shell Dressing, was extensively used in the Great War.

CHAPTER XVIII

THE OPERATING THEATRE

THE smooth working of an operating theatre depends on efficient team work. The surgeon, anæsthetist, theatre sister, nurses and orderlies are all interdependent. Members of the same team should practise working together as far as possible.

Every possible opportunity should be taken by members of a V.A.D. Detachment not only of seeing but actually taking part in the work of the operating theatre.

Preparation for Operation.—The preparation of the patient will be discussed in the next chapter. As regards the preparation of the theatre and instruments, etc., not only the immediate success of the operation, but the subsequent result, and even the life of the patient, depend on the closest attention to the minutest detail, on the part of the sister and her staff.

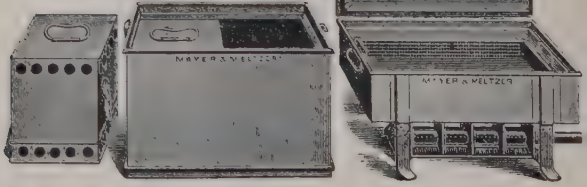


Fig. 49.—Combined sterilizer for dressings and instruments suitable for Active Service.

The Operating Theatre.—The modern theatre is subdivided into: (1) An *anæsthetic room*, into which the conscious patient is taken and where nothing must appear to alarm or disquieten him. (2) The *sterilizing-room* where instruments, utensils and dressings are sterilized by some form of steam apparatus. A simple portable apparatus, suitable for a small theatre on Active Service, is shown in Fig. 49. (3) A *store-room* where instruments are kept and notes written up. Here are usually the washing basins for the surgeon and his assistants. (4) The *main room*, where the operation is actually carried out.

Anæsthetic Room.—The nurse is responsible that the anæsthetic trolley is kept in order. Supplies of ether must be seen to (chloroform is very seldom used at the present time owing to the increased risk to which the patient is exposed by its administration).

Tongue forceps, gag, mask, drop-bottle, etc., must all be in position. Gas and oxygen cylinders must be tested and reserve supplies provided.

In the *sterilizing room* the instrument sterilizer must be kept boiling. Where instruments are constantly being boiled, less damage is done by the addition of bicarbonate of soda to the water. Instruments, bowls, trays, etc., are boiled before use and only handled by Cheatle's forceps (Fig. 34, p. 131). Surgeons' gowns, masks, overalls, towels, dressings and rubber gloves are all prepared in their appropriate drums and, when sterilized in the steam apparatus, kept ready for use.

Instruments are generally kept laid out on shelves in cabinets with glass doors. They are cleaned periodically, and if not in common use should be lightly smeared with vaseline or paraffin.

Writing materials must always be available, since no operation should be done without a record being made at the time.

Wash Basins.—In a modern theatre, arrangements of taps permit of the surgeon washing his hands and

forearms under a stream of warm running water. Once the surgeon and his assistant have "washed up," donned their sterile clothing and rubber gloves, they touch nothing that is not sterilized until the operation is over.

Operating Room.—This room should not be too large, otherwise it is impossible to keep it adequately warmed (70° Fahr.) in cold weather. A north light is preferable, and good lamps must be available, either electric or acetylene.

The operating table is made so that the head of the patient can be raised or lowered. Elaborate tables are in use in large hospitals, which permit of the patient being put into any required position.

The table is kept scrupulously clean, and must be capable of being warmed, either by a hot-water bed, or electric lights, or a stove placed beneath.

The theatre is kept clean and free from dust. After any septic operation, the greatest care must be taken to remove all traces of infective material.

The sister and nurses will anticipate all requirements of the surgeon and carry out the movements as speedily and quietly as possible.

On Active Service the operating theatre may be in a marquee, hut, or improvised building. Here, if the principles described above are carried out with the same care and attention to detail, it will be found that the results of operations are just as satisfactory and beneficial to the patient.

CHAPTER XIX

NURSE'S DUTIES BEFORE AND AFTER OPERATION

Preparation of the Patient.—Where time permits the patient is carefully prepared at least forty-eight hours before operation. He is put on a suitable diet, the bowels are opened, and attention is paid to cleansing the mouth, etc.

Oral asepsis is important. Inhalation of germs from a dirty mouth during anæsthesia may lead to pneumonia later.

In emergencies there is no time for the general preparation of the patient on the lines suggested above. In cases where traumatic (wound) shock exists a great deal has to be done before the patient is ready to go to the theatre (*see* B.R.C.S. Manual No. 1, p. 280).

While waiting for operation the patient is to be kept as warm and comfortable as possible. The nurse must be cheerful and encourage him if he shows signs of nervousness.

Local Preparation.—The surface of the part to be operated on is usually prepared by the nurse in the ward.

The operation will be attended by grave risk and by delay in convalescence if foreign germs are introduced. The skin over and around the operation area is shaved and washed with soap and water. It is then dried with sterile gauze and swabbed with methylated spirit. Some surgeons prefer picric-acid solution; the bright-yellow colour enables the nurse to see that she has thoroughly covered the area with her lotion. Iodine is still used by a few surgeons, but is expensive and irritating and possesses no advantages over plain spirit. The part is then

covered with a sterile towel and bandaged. The patient is put into warm pyjamas and operation stockings, and in the case of children the body and limbs are wrapped in cotton-wool and bandaged. False teeth are removed before the patient goes to the theatre, and care is taken to see that the bladder is emptied.

Treatment after Operation.—The nurse will note what form of anæsthetic has been used. Where a local anæsthetic has been injected, the patient is conscious and will not suffer from vomiting. If the anæsthetic has been injected into the spinal canal, he must be kept still and moved carefully with his head high, otherwise he will vomit.

Where gas and oxygen has been given as the general anæsthetic there will be little or no vomiting, and the patient will recover consciousness almost at once. After ether, there will probably be vomiting for a few hours. The patient must be placed so that his head is turned on one side and a gag must be available, in case there is spasm and difficulty in breathing. A long drink will often help in removing mucus impregnated with ether from the stomach, otherwise the patient must only be given fluid by sips till the vomiting is over. Many surgeons advise saline to be given by the rectum for the first few hours ; thirst is eliminated and vomiting lessened.

Diet.—In the first twenty-four hours the patient as a rule requires but little food, beyond fluids. The best guide is the appetite, and as soon as the patient asks for bread and butter, etc., it is generally safe to give it him.

The bowels are usually opened by an aperient on the second or third morning after operation. Even after a severe abdominal operation the patient can usually commence to take light solid diet on the fourth or fifth day.

Change of Position.—To help the patient to move in bed and alter his position, various contrivances are employed. One of the most useful methods

is to suspend by a rope from the ceiling, or by a hook fixed over the head of the bed, a smooth, round stick about 15 in. long and about 1 in. thick, so that it hangs crosswise just within easy reach. In this contrivance the patient finds great comfort ; by grasping it from time to time in his hand he may rest the arms, or he can alter his position in bed as he pleases. In certain illnesses, especially those affecting lungs and heart, and during convalescence from any illness, a bed-rest affords a welcome change of position (*see* p. 76).

Position.—Many abdominal cases, especially where there is peritonitis, are best nursed in what is known as the "Fowler position" (*see* p. 21). This is difficult for both patient and nurse, but is often of the greatest value in relation to the patient's chance of recovery. Patients subject to bronchitis must be well propped up. In the case of old people, it is often wise to put them into an arm-chair the next day, even after a severe operation.

Attention to the Dressing.—After operation the dressing must frequently be inspected to see that it is kept in place and that no bleeding is occurring. Where oozing is taking place, extra wool is placed over the outer dressing and kept in place with a firm bandage. If the bleeding is excessive and the patient shows signs of loss of blood, the matter must be reported at once. In some septic wounds any exposed blood-vessels are liable to give way suddenly. This condition is known as secondary hæmorrhage, and requires prompt treatment. A tourniquet should hang over the bed of a septic amputation stump, and the pressure-point for stopping the main vessel to the limb concerned should be ascertained in such cases.

Bed-cradle.—When it is desirable to prevent pressure of the bed-clothes on the body or limbs, a bed-cradle may be arranged over the patient. It is made of metal or wooden hoops fixed on wooden supports and wide enough to enclose a limb, or the

whole body. A bed-cradle may be improvised from a band-box, or from a small packing-case from which the lid, bottom, and one side are removed, when it stands like a stool upon the bed; a three-legged stool makes a good "cradle" for a limb (*see* B.R.C.S. Manual No. 1, p. 35). If none of these is at hand, a piece of twine may be passed through the bed-clothes and fixed to either the bottom or the top of the bedstead, to a stand by the side of the bed, or to a pole of sufficient height fixed to the sides or foot of the bed, so that the string can be tied to it and the bed-clothes supported. On all occasions when a "cradle" is placed over the body a light blanket should be put over the patient beneath the cradle (*see* p. 81).

CHAPTER XX

ROLLER AND MANY-TAILED BANDAGES

THE triangular bandage, apart from first aid, is extremely useful. For a description of its application the reader is referred to B.R.C.S. Manual No. 1.

Roller Bandages. Materials.—Unbleached calico is the material commonly used for making roller bandages. In teaching and practising the art of bandaging, unbleached calico should always be used, as, owing to its stiffness and substance, the correct methods of making reverses, figures-of-8, etc., can be more easily learnt.

White cotton or *sheeting* material makes a comfortable and efficient roller bandage. Linen is seldom used owing to its cost.

Flannel bandages are most commonly used for the trunk and for rheumatic joints.

Gauze is useful as a means of retaining dressings, but does not afford the support to the limbs that the stouter materials do.

Domette is useful for retaining dressings and splints in position.

Muslin and *crinoline* are employed in the application of plaster-of-Paris, starch, and silicate bandages.

Crepe bandages are on the market. They are comfortable and strong.

Widths and Lengths of Roller Bandages (Fig. 50).—As a general rule the widths and lengths of roller bandages for the different parts of the body should be as follows :—

Part bandaged.	*Width.*	*Length.*
Finger	¾ in.	1½ yd.
Upper limb	2½ "	
Lower limb	3 " (women)	4 "
	3½ " (men)	6 "
Trunk	6 "	8 "

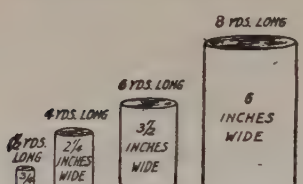


Fig. 50.—Regulation widths and lengths of roller bandages.

Named Parts of a Roller Bandage.—When a roller bandage is ready for application the roll is termed the " head " of the bandage, the loose end the " free end " or " tail," and the surfaces the " outer surface " and " inner surface."

For practical purposes a supply of 3-in. roller bandages is sufficient. With a sharp knife the roller bandage can readily be cut into 1-in. or 2-in. widths.

Single-headed Roller Bandage.—This is the technical name for the roller bandage in common use (Fig. 51); it is so named to distinguish it from the double-headed bandage.

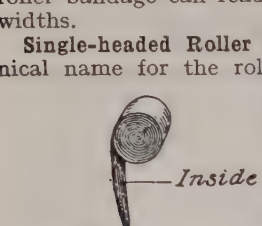


Fig. 51.—Single-headed roller bandage, showing head, end and sides.

Double-headed Roller Bandage.—This consists of a bandage rolled from both ends towards the centre of the material, so that there are two heads (Fig. 52). The double-headed roller may also be made by pinning or stitching together the ends of two single-headed bandages which are equal in length and width.

To Make up a Roller Bandage.—The two essentials in rolling up a bandage are that it be done tightly

and that the edges be even. Should any threads be frayed out they must be pulled or cut off.

In rolling up by hand, commence at one end of the strip by making a few rolls as a nucleus; then hold the bandage as in Fig. 53, that is, with the thumbs above and the forefingers beneath the strip,

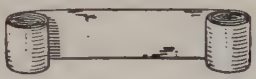


Fig. 52.—Double-headed roller bandage.

the ball of the thumbs pressed against the sides of the roll so as to keep all in place. The bandage is "fed" to the upper part of the roll (Fig. 53), and the forefingers beneath press upon the head of the bandage so that it is kept tight. To keep the bandage smooth and tight as it is being "fed"

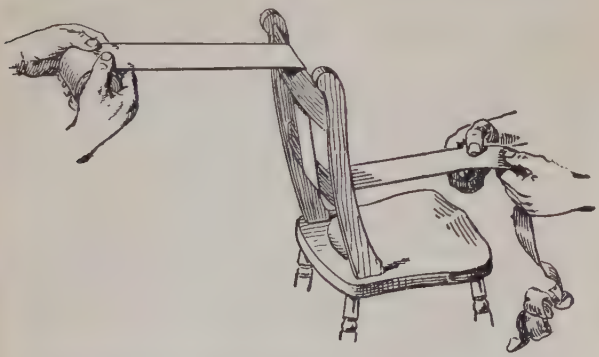


Fig. 53.—Bandage passed over bars on back of chair to keep it smooth and tight in rolling.

to the roll there are various devices. One person may simply hold the loose end, smoothing the

creases if there are any, and keeping it fairly tight as it is slipped through the fingers. If no helper is at hand, the free end may be placed on the floor and the foot put on it so as to keep it tight; this is apt to dirty the bandage unless it is placed on a towel

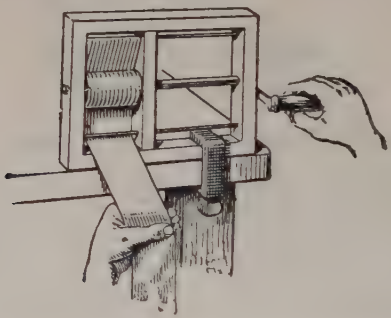


Fig. 54.—Rolling machine. The handle, with the rod it turns, is pulled out when the rolling is complete.

and the bandager's boot is protected by a handkerchief, piece of paper, or some such device. Or a roller-machine, as in Fig. 54, may be used. If a helper is at hand, the bandage may be run over the bars of the back of a chair (Fig. 53).

Uses.—Roller bandages are used :—

(*a*) To retain dressings and splints in position.

(*b*) To exercise pressure upon a part with the object of reducing swelling, as in "dropsy" of the limbs, or to cause absorption of inflammatory thickening in the limbs and joints, especially the latter.

(*c*) To support a joint after it has been sprained or dislocated when the patient begins to use the limb as in walking.

(*d*) To support a limb in which varicose veins threaten or have developed.

(*e*) To prevent swelling of a limb below the spot where a dressing has been bandaged fairly tightly; thus a bandage applied firmly to the elbow is apt to cause swelling of the hand or forearm; or an injured leg, if bandaged tightly from above the ankle to the knee, will cause swelling of the foot.

(*f*) To prevent hæmorrhage from small blood-vessels after injury, or operation, for this purpose the bandage must be applied evenly and firmly.

Rules to be observed in applying Roller Bandages.—These may be formulated as follows:—

(1) Bandage the limbs from below upwards; that is, from the fingers towards the shoulders and from the toes towards the hips.

(2) Bandage the chest from below upwards; that is, from the lower ribs towards the shoulders.

(3) Bandage the abdomen from above downwards, that is, from the region of the stomach downwards to the pelvis.

(4) In applying a bandage to the limbs to retain dressings or splints, do not cover the tips of the fingers or toes, but leave the nails to be seen. By the appearance of the nails, and of the ends of the fingers and toes, the state of the circulation can be judged; a bluish colour of the nails indicates that the veins are being compressed, and numbness, swelling, and immobility of the fingers or toes shows that the bandage wants slackening or the splints and dressings readjusting.

(5) It is well also to leave the tip of the elbow and the heel uncovered when a bandage is applied along the length of the limb, in order to be able to gauge the state of the circulation and prevent strangulation of the tissues by over-tight bandages. Of course, when the elbow or heel is wounded or diseased, it must be covered by the bandage.

(6) When bandaging limbs, take up a position exactly opposite the hand or the foot, as the case may be, not at the side of it.

(7) In bandaging limbs, commence by applying the outside of the bandage to the side of the limb next the middle line of the body (inner side); that is, always bandage from within outwards.

(8) In bandaging limbs, the nurse or dresser should hold the bandage in the left hand when the limbs of the right side are to be bandaged, and in the right hand when the limbs of the left side are to be dealt with.

Precautions in applying the Roller Bandage.—(1) Never commence a bandage for either upper or lower limb by taking turns round the wrist or above the ankle as a preliminary to carrying the bandage round the hand or foot. Further, a roller bandage should never be carried horizontally round the limb; all turns must be made in an oblique or spiral fashion, hence the terms spiral, reverse spiral, figure-of-8, applied to the different forms in which the roller bandage is applied.

(2) In applying a bandage to the upper limb, always bend the elbow when this part is being approached. To bandage the elbow when the limb is straight and then to bend the elbow to place the arm in a sling will arrest the flow of blood in the large veins, which can always be plainly seen immediately beneath the skin at the front of the elbow. Theresult will be pain in the limb, blueness of the nails, swelling and congestion of the fingers, hand, and forearm; and if the bandage is maintained long enough, the whole limb below the elbow may become black and gangrenous, necessitating amputation to save life.

(3) It is not easy to learn bandaging from books alone. Practise on all possible occasions, aiming at neatness, as well as at making the patient comfortable.

(4) Many of the examples of roller bandaging here given are useful chiefly from the examination point of view. The use of the triangular or modified many-tailed bandage, as later described, should be adopted as far as possible in practical work.

Bandage for the Hand, Wrist, Forearm, Elbow, and Arm

Straighten the limb, bring it away from the side of the body, extend the fingers, turn the hand so that the palm looks downwards, that is, in the position of pronation (*see* B.R.C.S. Manual No. 1), and stand opposite the extended fingers. When bandaging the right limb, hold the bandage in the left hand, or vice versa.

To bandage the **hand and wrist**, lay the outside of the bandage on the inner aspect of the wrist (Fig. 55), carry it obliquely over the back of the hand, round the little finger side of the hand, across the palm, round the forefinger side of the hand, and horizontally across the back of the fingers, so that the lower border of the bandage just touches the root of the nail of the little finger (Fig. 56). The bandage is again carried round the

Fig. 55.—Bandage for right upper limb commenced.

front of the hand, round the forefinger, and then obliquely upwards towards the wrist, which it encircles. The turns round the hand and wrist are repeated three or four times, thus making "figure-of-8" loops (Fig. 57). The crossings of the bandage should come exactly in the middle of the back of the hand, each turn exposing one-third of the previous

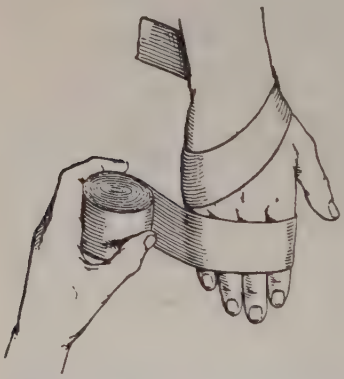


Fig. 56.—Bandage for upper limb applied over hand.

Fig. 57.—Figure-of-8 bandage for hand, and simple spiral for wrist.

turn, so that three layers of the bandage cover every part of the hand and wrist.

To Bandage the Forearm.—After bandaging the hand, take three turns upwards from the wrist, carrying the bandage up the limb as a simple spiral, so that one-third of the previous turn is exposed. On reaching the more muscular part of the forearm it will be found that the simple spiral turns no longer lie evenly on the limb, the lower border becoming loose. To obviate this difficulty it is necessary to make an ascending reverse spiral bandage (Figs. 58, 59), as follows: While supporting the forearm with the fingers of the free hand, carry

the bandage across the back of the forearm, keeping its head inclined upwards so that the bandage lies flat on the skin ; whilst it is in this position place

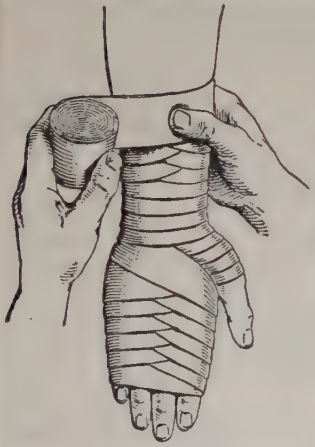


Fig. 58.—Position of hands when about to make a "reverse"

Fig. 59.—"Reverse" being made.

the thumb of the hand supporting the limb on the bandage just below its upper border, and bring the head of the bandage downwards, so that the upper edge folds over the thumb, when a "reverse" is

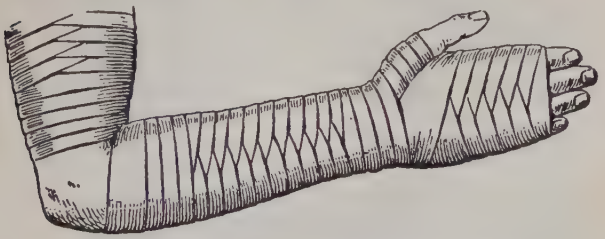


Fig. 60.—Bandage for upper limb completed.

made. Carry the bandage again round the limb and repeat the reverse, and continue up the forearm towards the elbow. As the ascending reverse spiral is being made, each turn exposes one-third of the breadth of the previously applied turn. In this manner three folds of the bandage are applied to the limb (Fig. 60).

As the elbow is being approached, the forearm is bent at a right-angle to the arm, with the palm directed towards the chest.

To carry the bandage over the elbow a series of figure-of-8 turns is made, one loop of the "8" embracing the forearm, the other the lower end of the arm, the crossing being made in front of the elbow. The lowest turn on the forearm is first made, then the lowest turn on the arm immediately above the elbow; and so on until all the four turns are made. The tip of the elbow is not covered by this bandage unless there is reason for so doing.

Fig. 61.—Commencing bandage to cover tip of right elbow. The hanging end is passed to inner side as the first turn is being completed.

To Cover Tip of Elbow.—Lay the outer side of the bandage on the inner side of the elbow, carry the bandage over the tip of the elbow, and round the limb at the elbow level; the second turn is made to encircle the arm, and the third the forearm. Each of these turns covers the margins of the first-applied turn. The figure-of-8 turns are continued

upwards and downwards alternately until some six or more are made (Figs. 61, 62, 63).

To Bandage the Arm.—The bandage is continued from the elbow as a simple spiral up the arm; if, however, the arm is very muscular reverses must be made on the outer aspect of the arm as high as the axillary folds at the shoulder will allow.

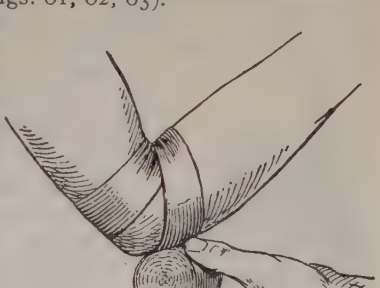


Fig. 62.—Bandage to cover tip of right elbow, showing early turns.

*** To Bandage the Fingers.** 1. *The continuous finger bandage to cover all the fingers.*—This is required (1) when the fingers are scalded or burned; (2) when several or all of them are crushed or otherwise injured; (3) when they are all threatening to swell or have actually swelled, owing to injury or to too-tightly applied bandages higher up the limb, when the circulation in the hand and fingers is thereby impeded. Select a finger bandage of calico or tape ¾ in. in breadth and 4 yd. long. Turn the hand with the palm downwards (pronation) and extend the fingers.

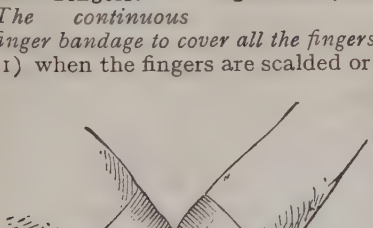


Fig. 63.—Bandage for tip of right elbow, completed.

Stand opposite the finger-tips of the hand to be bandaged. Lay the outside of the bandage on the inner aspect of the wrist, leaving 4 in. of the bandage end free, so that it may be used for tying the bandage when finished. Carry the head of the bandage obliquely across the back of the hand to the root of the little finger. Take a spiral turn round the finger so as to bring the bandage up to the nail of the little finger. Carry the bandage round the little finger, the lower border of the bandage crossing the finger parallel to the root of the nail, then make ascending spiral turns round the little finger, exposing one-third of the breadth of the previous turn, until the root of the finger is reached, when the bandage is brought round the little finger side of the hand obliquely over the back of the hand towards the wrist, which is again embraced. The ring and each consecutive finger, including the thumb, are thus covered and the end is tied off at the wrist, the initial end left free being utilized for the purpose. It will be observed (Fig. 64) that the bandage as it leaves each finger is brought over the back of the hand, not over the palm, as it is the back of the hand that swells when the blood-vessels are impeded and not the palm, of which the thickness of the tissues prevents swelling.

Fig. 64.—Continuous finger bandage.

2. *Bandage to cover finger-tip.*—This is required when the point of the finger has to be covered to retain a dressing in place. Use a bandage 1½ yd. long and ¾ in. wide. Stand opposite the extended

finger. Pronate the hand. Lay the bandage on the inner aspect of the wrist, leaving 4in. of the end free, whereby finally a knot may be made in tying off the bandage. Carry the head of the bandage over the back of the hand obliquely to the little-finger side of the root of the finger to be covered, around which a loose spiral turn is made to reach the tip.

Fig. 65.—Covering tip of finger.

Hold the finger up and with your own forefinger placed at the back of the middle bone of the finger, and the thumb at a corresponding point in front of the finger, carry the bandage over the tip of the finger (Fig. 65), backwards and forwards, securing the folds in place with your forefinger and thumb. The bandage over the end of the finger is made first to pass over the centre of the finger-tip ; the second turn is made to lie a little to one side of the tip, the third turn to lie to the opposite side of the finger-tip to the second turn. Three turns thus made should completely cover the finger-tip, unless the dressing is bulky, when one or two additional turns on either side are made. The folds over the finger-tip are now held in place by bringing the head of the bandage around the finger close to the tip, passing first to the thumb side of the finger, when a simple spiral bandage is applied from the tip to the root of the finger, and the bandage carried over the back of the hand to the wrist, where the ends are tied. A better fixation is afforded by first tying a knot with the two ends over the back of the wrist and then carrying the free ends round the wrist and tying them off. The turns

round the finger may be in the form of simple spiral turns, or the bandage may be carried in figure-of-8 turns from tip to root (Fig. 67). Unless the precaution given above is observed, namely, to bring the bandage round the thumb side of the finger after the backward and forward turns are taken over the finger-tip, the bandage when it reaches the root of the finger will be on the little-finger side of the root, that is, the same side as the bandage reached the root of the finger from the back of the hand. The finger is thereby less supported, and it is an important point to keep the finger braced back so that it may be out of the way of the other fingers, more especially if the hand is to be used for writing, for work, or at meals.

Spica Bandage for the Thumb.—The word spica is applied to bandages for thumb, shoulder, groin, etc., as the crossings of the bandage turns bear a resemblance to the position of the grains in a head or spike of barley.

Place the hand midway between pronation and supination, with the back of the thumb upwards. Stand opposite the hand. Select a bandage $\frac{3}{4}$ in. wide and $2\frac{1}{2}$ yd. long. Lay the free end of the bandage across the front of the wrist, leaving 4 in. free in order finally to tie the ends. Carry the head of the bandage across the back of the root of the thumb to the little-finger side of the thumb (that is, between thumb and forefinger). Then take a wide spiral turn round the thumb to within $\frac{1}{2}$ in. of the root of the nail. Take one (or two) turns round the thumb horizontally so that the lower border of the bandage is $\frac{1}{2}$ in. above the root of the nail.

The next turn passes obliquely down the back of the thumb, crossing forwards to the palmar aspect to reach the ball of the thumb, whence the head is carried round the wrist, then up over the back of the hand and thumb, then round the thumb, and again obliquely across its back towards the base of the thumb in front. These turns are repeated

again and again until five or six turns are made, the ends being then tied off at the wrist.

The spica bandage will be seen to be a figure-of-8 bandage, one loop enclosing the wrist and the other the thumb (Fig. 66).

When the point of the thumb is required to be covered, proceed in the same way as when other fingers have to be covered; the spica bandage may

Fig. 66.—Spica bandage for thumb.

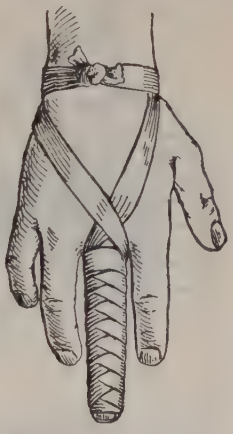


Fig. 67.—Spica bandage for finger. Tip not covered.

be applied round the root of the thumb after covering the point.

For the spica bandage as applied to a finger, *see* Fig. 67.

Spica Bandage for the Shoulder.—To bandage the (right) shoulder select a bandage 3 or 3½ in. wide and 8 yd. long. Stand opposite the right shoulder. Holding the bandage in the left hand, carry it round the arm 2 in. above its centre and with the second

turn make a reverse on the outer side of the limb, repeating the turns with reverses three or four times until the folds of the armpit (axilla) are reached; then carry the bandage over the shoulder and round the back of the body beneath the opposite (in this case the left) axilla (in which a piece of cotton-wool should be placed to prevent chafing). The bandage is then carried over the chest and round the shoulder. The turns round the body in this figure-of-8 fashion are repeated four or more times until the shoulder is completely covered. As in other applications, one-third of each layer is left exposed by the next one superimposed, so that there are three layers on every part. The crossings must be in line one with another and also in a line with the reverse spirals round the arm, so that it is impossible to know, when the bandage is deftly applied, where the reverse spiral turns end and the spica or figure-of-8 turns commence (Fig. 68).

Fig. 68.—Spica bandage for right shoulder.

*** Bandage for the Collar-Bone.**—Although fracture of the collar-bone is temporarily supported by triangular bandages to begin with, it is usual to apply plaster or a roller bandage subsequently. Wood's collar-bone bandage is applied as follows: Take a bandage 3 to 3½ in. wide and 14 yd. long. For the right collar-bone, after applying a thick pad in the right armpit (axilla) and a piece of cotton-wool in the left axilla to prevent chafing, stand opposite the (in this instance) right side of the

body. Bend the elbow, lay the forearm across the front of the chest, and place a piece of cotton-wool between the palm of the hand and the chest; the hand should be kept a little above the level of the elbow. Holding the bandage in the left hand, apply the outside of it to the inner side of the arm immediately above the elbow and take a couple of turns, carrying the elbow well back at the same time. The bandage is now carried across the back and round the left side to the front, where it is passed just below the hand and along the back of the forearm, and over the elbow, pressing the elbow well to the side. The bandage is now carried upwards over the back to below the left axilla, then over the front and top of the left shoulder, and down the back to beneath the right elbow. It is then carried up the front of the arm, over the top of the right shoulder, down across the back, round the left side of the body to the front, again over the forearm, and so on, the turns being repeated until some six or eight turns round the body and over the shoulders are made. At each turn round the body the bandage is carried higher so as to expose one-third of the previous turn, and at each turn beneath the elbow (and forearm) and over the right shoulder the bandage is carried farther inwards, exposing one-third of each previous turn. Instead of using a 14-yd. bandage in one piece, it is better to take an 8-yd. and a 6-yd. bandage, pinning the ends together when the first has been applied (Fig. 69).

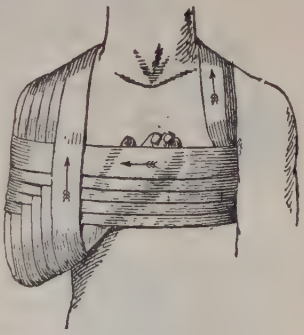


Fig. 69.—Bandage for right collar-bone.

Bandage for Foot, Ankle and Leg

Directions for Bandaging the Left Lower Limb.—When the bandage is to be carried to just below the knee the width should be 3 to 3½ in., and the length 6 yd. When the bandage has to be carried over the knee 10 yd. will be required. If the patient is in bed, elevate the left heel upon a support 6 in. high; if he is up and about, seat him in a chair. The dresser then sits in a chair opposite the patient at a convenient distance, lays a towel over his own (in this instance) right knee, placing the heel of the limb to be bandaged on the tip of his knee (Fig. 70).

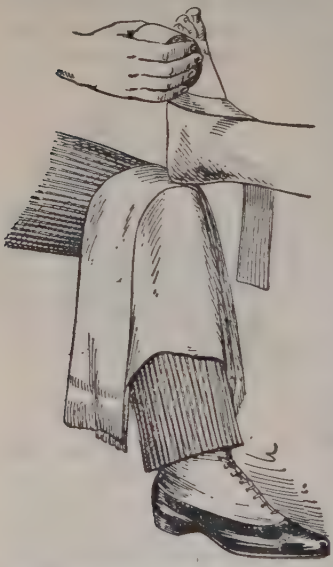


Fig. 70.—Commencing to bandage left lower limb.

To Bandage the Foot and Ankle.—Lay the outer side of the bandage on the inner side of the limb on a level with the ankle. Carry the bandage across the back (dorsum) of the foot in a direction towards the little toe. Bring the bandage round the sole of the foot on a level with the ball of the toes to the inner side of the ball of the great toe, then across the dorsum of the foot horizontally on a level with the root of the little toe, and then once more across the sole to the inner side of the foot. Thence bring the bandage across the dorsum obliquely to the outer side of the foot just above and behind the tip of the heel, then round the back of the heel to the inside of

the ankle. Thence the bandage is brought once more round the foot, and again round the back of the heel. Figure-of-8 turns are thus made, one loop enclosing the foot, the other the ankle, until four (or more) turns are made. The bandage is now brought round the lower part of the leg, where three turns of a simple ascending spiral bandage are made. If there is no necessity to go higher the bandage is pinned off (Fig. 71)

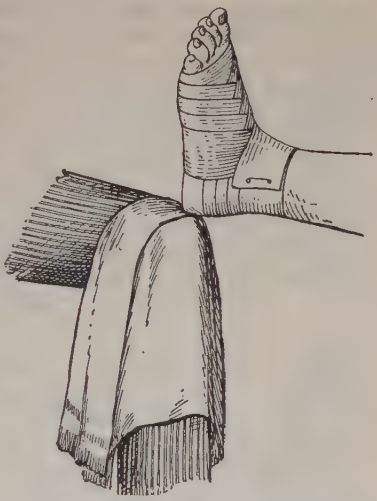


Fig. 71.—Bandage for left lower limb carried over foot and ankle. Heel left bare.

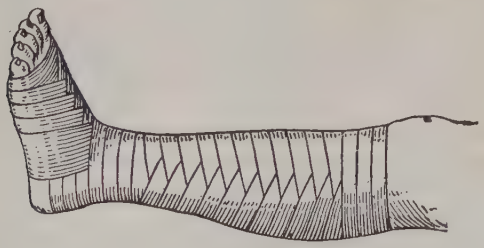


Fig. 72.—Bandage for left lower limb carried as far as the line, showing figure-of-8 for foot, ascending simple spiral for lower part of leg, ascending reverse spiral for calf of leg, and ascending simple spiral just below knee.

To Bandage the Leg.—The bandage is carried up the leg from the foot as a reverse spiral bandage (Fig. 72) to 3 in. below the knee (that is, to where the swelling of the calf ends); this having been done, three turns of a simple spiral are made.

N.B.—(1) The tip of the heel being on the top of the bandager's knee, the bandage can be applied without raising the limb from off the supporting knee. (2) The reverses are all made on the outer, muscular part of the leg, never over the sharp edge of the tibia (shin-bone) in front.

Bandage to Cover the Heel.—Support the leg on a pillow or seat of a chair so that the heel projects well over the edge. Keep the foot at right angles to the leg. Lay the outside of the bandage on the inner side of the ankle. Bring the bandage straight across the front of the ankle, round the outer side, and over the tip of the heel, so that the centre of the turn lies over the tip of the heel. The bandage is again carried round the ankle and slightly below the tip of the heel. The next turn is brought round a little above the tip of the heel, and the turns are continued alternately below and above the heel, so that the last turns are about half-way along the foot and well above the ankle. (Fig. 73.)

Fig. 73.—Bandage to cover tip of heel.

Bandage to Cover the Knee.—Support the heel on a pillow so that the knee is raised from off the bed to allow the bandage to pass underneath. Use a bandage $3\frac{1}{2}$ in. wide and 6 yd. long. Apply the outside of it to the inner side of the knee, and carry it across the front of the knee-cap to the outer side. The bandage is then brought round the knee slightly obliquely just below, and the next turn is carried round slightly obliquely just above, at the centre of

the knee-cap. Turns are made round the knee, alternately below and above the joint, until the upper end of the leg and the lower end of the thigh are covered to the extent of 3 in. below and above the knee-cap. The bandage may also be applied as in Fig. 74.

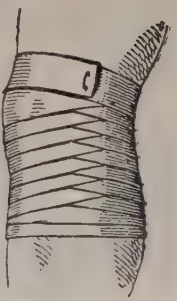


Fig. 74.—Bandage for knee.

Bandage for the Hip.—Use a bandage 3½ in. wide and 8 yd. long. Stand on the outer side of the (left) hip. Place the outside of the bandage on the inner side of the thigh, 6 in. below the groin. Carry the bandage horizontally round the limb and make four ascending reverse spiral turns round the thigh. Carry the fifth turn across the front of the left groin, round the left side of the body just below the crest (highest point) of the haunch-bone (innominate), round the body, down the outer side of the thigh, and again round the trunk and thigh until four (or more) turns are made. (Fig. 75.)

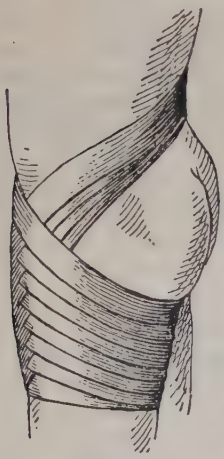


Fig. 75.—Spica bandage for left hip. If the crossings were farther forward a spica of the groin would be made.

Bandage for the Groin.—A single spica for the groin is applied as for the hip, the crossings being made over the front of the groin, and the reverse spiral turns round the thigh being omitted. In applying a double spica for both groins, use a bandage 3½ in. wide and 16 yd. long. Standing in front of the patient, lay the outside of the bandage in the

front of (say) the right groin; carry the bandage round the outer side of the right thigh, then over the front of the right groin, round the right hip, across the back, along the left groin, down the inner side of the left thigh, round the left thigh, up over the left groin, and across the lower part of the abdomen to the outer side of the right hip. The bandage is now brought round the back, across the lower part of the abdomen to the outside of the right thigh, round the right thigh and body to the left groin; these turns are continued until the part is sufficiently covered, making four or five turns. Each succeeding turn is higher than its predecessor. (Fig. 76.)

Fig. 76.—Double spica for groins. If applied to one side only, a single spica for groin is made.

St. Andrew's Cross.—A useful variation of the double spica for the groins consists in making the turns of the bandage pass the perineum in such a way that they form a cross in front of the anus. An extensive dressing is thus kept in position.

Bandages for the Head

***Capelline Bandage.**—This is used to keep a dressing on the head; it is a useful bandage to apply in ringworm and other diseases of the scalp, especially when the scalp has been shaved. Use a double-headed roller bandage (Fig. 52), 2½ in. wide and 8 yd. long. To secure an equal amount in each head of the bandage, a good plan is to mark the centre of the length of the bandage by a pin, when each end is rolled towards the pin; the pin is then removed. Instead of rolling from the ends of one bandage, two

bandages 2¼ in. wide and 4 yd. long may be pinned together, the outside of the end of the bandage being applied to the inner side of the end of the

Fig. 77.—Commencing double-headed roller bandage for head.

other. Stand behind the patient whilst he is seated on a chair. Apply the outside of the bandage to

Fig. 78.—One head being continued round the scalp and the other going over it.

the forehead, the lower border of the bandage lying just above the eyebrows (Fig. 77). Carry each head of the bandage backwards over the side of the

temple, and above the ears to the back of the head (Fig. 78). Here the ends are crossed, the upper bandage being continued onwards round the head whilst the other is brought upwards over the centre of the top of the scalp as far as the root of the nose (Fig. 79). The bandage that encircles the head is then brought over the forehead, covering the bandage that traverses the scalp, and so fixing the latter in place. The turns are continued, the scalp end of the bandage passing alternately backwards and forwards first at one side and then at the other of the central fold until the whole scalp is covered :

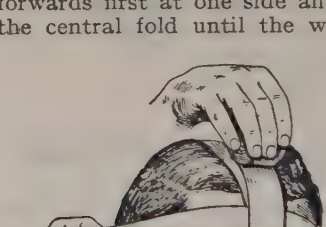


Fig. 79.—Scalp turn being secured by horizontal turn.

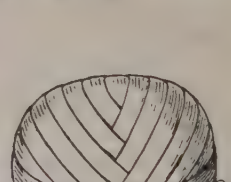


Fig. 80. — Capelline bandage completed.

while the bandage that encircles the head fixes each fold of the scalp turns as it is made (Fig. 80). At the finish both ends of the bandage are carried round the head horizontally above the ears and pinned off.

***Half-Capelline Bandage.**—This bandage is made by passing the scalp folds backwards and forwards over one side of the head only, the other bandage encircling the head as for the whole head bandage.

Four-tailed Bandage for the Head.—Take a piece of calico (or other material) 1 yd. long and 8 in. wide. Tear or cut from the centre of each end to within 5 in. of the centre of the bandage, thus leaving a part 10 in. long undivided in the centre.

(1) *For the Top of the Scalp.*—Lay the centre of the undivided part of the bandage in the centre of the top of the head. Bring the two front ends backwards behind the ears and tie at the back of the neck, then bring the two back ends forward in front of the ears and tie below the chin. (Fig. 81).

(2) *For the Front of the Scalp (Forehead).*—Bring the two front ends horizontally round the head and tie at the back of the neck. The two back ends are tied below the chin.

(3) *For the Back of the Scalp.*—Bring the back ends horizontally round the head above the ears and tie

Fig. 81.—Four-tailed bandage for top of scalp.

Fig. 82.—Four-tailed bandage for chin.

in the middle of the forehead in a line with the eyebrows, then bring the two front ends down and tie below the chin.

Four-tailed Bandage for the Chin.—Use a bandage 6 in. wide and 1 yd. long. Tear the ends from the centre to within 4 in. of the centre of the bandage, thus leaving a piece 8 in. long undivided in the centre. A slit 1½ in. long may (if advantageous) be made in the centre of the undivided portion to accommodate the tip of the chin. The lower ends are carried upwards in front of the ears and tied on

the top of the head; the upper ends are carried round the neck below the ears and tied at the back of the neck. The four ends left over after tying the knots are tied together, the two left ends and the two right ends respectively being tied together. The knots for the bandage ends should be made well up towards the top of the head, so that the patient may not be inconvenienced by them when the head is laid on a pillow. (Fig. 82.)

Halter Bandage (Fig. 83).—This is used to keep a dressing in position on the scalp or over the temple, where pressure is required. A variation may be used to keep a dressing on the chin. The free end of a 3 in. bandage is laid on the top of the head, and the first turn made down under the chin in front of the ear, passing up in front of the other ear. When the head of the bandage comes to the front of the ear again, the bandage is held in position and fixed by a transverse turn taken round the occiput and forehead. It is pinned off where the vertical and horizontal turns cross.

*** Spica for the Head and Neck** (Fig. 84).—This bandage is useful to keep dressings on the neck and at the same time to prevent the patient moving his head too freely.

The first step consists in covering the lower part of the dressing by turns carried over the shoulder of, say, the left side and round the opposite side of the neck. The bandage passes from the centre of the dressing forwards, downwards, backwards, and then up, crossing the free end, next passing round the neck. After at least two such turns have been taken the bandage is carried forwards in front of the neck under the chin, up in front of the right ear, over the top of the head, round the occiput, under the chin and up in front of the left ear. From here it passes to the top of the head down behind the right ear, round the occiput, forwards above the left ear, and transversely round the head, being finally pinned off over the centre of the dressing below the ear.

Mastoid Bandage (Fig. 85).—To bandage the right mastoid the first turn is passed forwards round the forehead fixing the upper border of the dressing. A

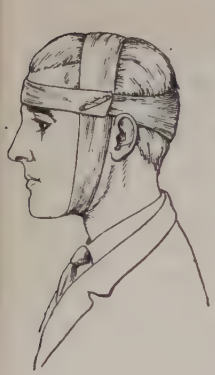


Fig. 83.—Halter bandage for scalp.

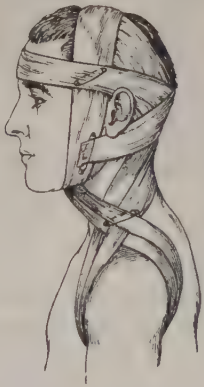


Fig. 84.—Spica for head and neck.

Fig. 85.—Mastoid bandage.

second turn on leaving the occiput is made to cover the lower edge of the dressing. This turn is fixed up by a third horizontal turn which covers the remainder of the dressing and is then pinned off.

Bandages for the Abdomen, Chest, etc.

Bandage for the Abdomen.—To keep dressings upon the abdomen and lower part of the chest, flannel is the most comfortable material for the patient. Use a bandage 6 in. wide and 8 yd. long. The abdomen must be bandaged from above downwards—that is, commence above. If commenced below, the bandage will push the contents of the abdomen up against the diaphragm, and thus impede breathing and the action of the heart; if it is commenced above, the ribs prevent this discomfort and

danger. Carry the bandage round the trunk in descending simple spiral turns, each turn leaving half (not one-third as for the limbs) of the previous turn exposed. See that the pin fastening the end of the bandage is fixed in front, so that the patient need not lie upon it. A many-tailed bandage is now in general use, both for the abdomen and chest.

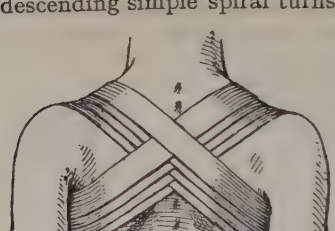


Fig. 86.—Figure-of-8 bandage applied to shoulders.

Bandage for the Chest.—In bandaging for broken ribs, etc., commence over the lower ribs and bandage upwards, covering the half of each turn with the succeeding turn.

Bandage to Keep the Shoulders Back.—This is sometimes used in fracture of both collar-bones and for stooping shoulders. It should be applied in figure-of-8 fashion, as in Fig. 86. Both armpits are to be protected by cotton-wool.

Bandage for the Breast.—(1) To support *one breast* (say the right), take a bandage 3 or 4 in. wide and 6 yd. long, commence the bandage (outside of bandage next the skin) below the breasts (Fig. 87), and carry the head first to the right, and round the body horizontally twice. At the third turn carry the bandage upwards beneath the right breast and

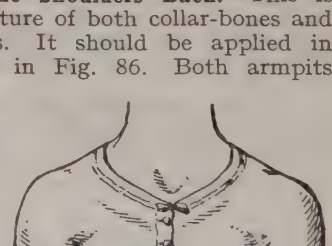


Fig. 87.—Commencing bandage for right breast.

over the top of the right shoulder, then down the back round the body. These turns are continued, making one turn round the trunk and one beneath the breast and over the right shoulder alternately until four, five, or more turns are made, when the breast will be supported as in a cup of bandage (Fig. 88). A second bandage is added if necessary. (2) To support *both breasts*, commence the bandage beneath (say) the left breast, varying it to the left and round the body twice, upwards beneath the left breast, over the top of the left shoulder, down the back, round the right side of the chest, then up the back, over the top of the right shoulder, across the chest beneath the right breast, round the left side of the chest horizontally, across the back, round the right side of the chest, up beneath the left breast, over the top of the left shoulder, and repeat these turns until four or five turns are passed beneath each breast. (Fig. 89.)

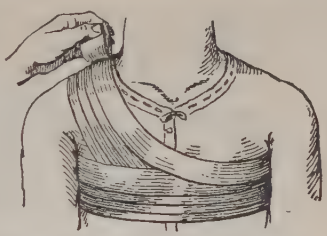


Fig. 88.—Bandage to support right breast.

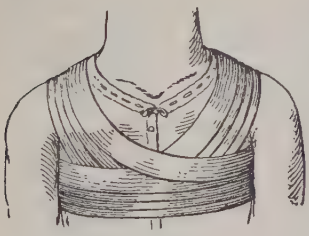


Fig. 89.—Bandage to support both breasts.

N.B.—It is impossible to follow the written description of this bandage (and many others) unless the dresser has a model to practise on and systematically follows the steps in the text as he proceeds.

Many-tailed Bandage.—A convenient bandage for retaining dressings on several parts of the body,

such as the abdomen, chest, or thigh, when it is desired to reach a wound or change a fomentation, poultice or dressing without moving the patient, is named, on account of its numerous ends, the many-

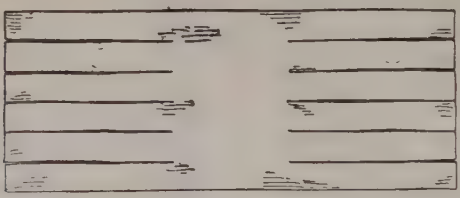


Fig. 90.—Many-tailed bandage with parallel ends.

tailed bandage. The bandage may be with either (*a*) parallel (Fig. 90) or (*b*) overlapping (Fig. 91) tails.

(*a*) The parallel form may be made from a piece of calico or flannel. From the edges the bandage is torn in strips, varying in width according to the part to be covered, but the centre part remains undivided; for the chest and abdomen the tails should be 3 to 4 in. and for the limbs 2 to 3 in. in width.

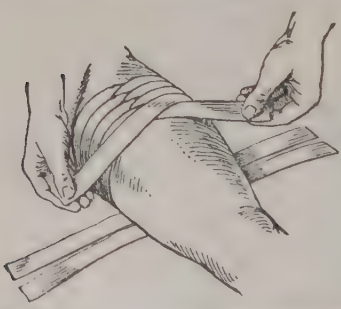


Fig. 91.—Many-tailed bandage for thigh (overlapping ends).

(*b*) In this form (Fig. 91) each strip overlaps the preceding one, to the extent of one-third on its lower border. When a sufficient number are laid down the whole is fixed together, either by a piece of bandage laid along the centre of the strips from the upper to the lower borders and stitched there, or the strips

are stitched along the centre without a superimposed strip.

The many-tailed bandage should be long enough

Fig. 92.—Many-tailed bandage for finger.

to go once round the part to be bandaged and one quarter more, and its depth (from upper to lower border) according to the amount to be covered. Thus, for the chest the bandage should be in length equal to the circumference, and a quarter more ; for instance, if the chest circumference is 36 in., the length of the bandage strips is 45 in., and the depth of the entire bandage from the level of the armpits to half-way down the waist. The same rule applies to the abdomen, the thigh, etc.

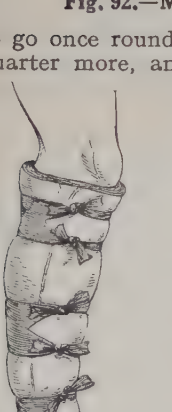


Fig. 93.—Many-tailed bandage for leg.

In applying the bandage to the chest and abdomen the lower ends should first be crossed over each other in front ; the next secures the first, the third the second, until the last turn of all is made, when a safety-pin is used to fix the ends. To keep a dressing on the thigh the lower ends may be applied before

the upper, but as a rule it is better to bandage from above downwards.

Improvised Many-tailed Bandages.—Many-tailed bandages may be improvised by tearing a 3-in. roller bandage into suitable lengths. Fig. 92 shows this method applied as a finger bandage, one tail passing round the wrist. Fig. 93 demonstrates the ease in taking down the dressings of an injured leg which this, the many-tailed, affords. Any adjustment necessary can be made by retying two or more of the tails without disturbing the rest, and lastly, the bandage can be undone without disturbing the limb. Less bandage is used than in the spiral method, and less time is spent both in applying and removing the bandage. This method is especially useful where a splint is in use, as in a fractured forearm.

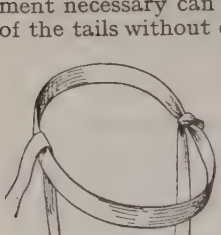


Fig. 94.—T-Bandage. The circular turn is carried round the waist; the loop passes between the thighs.

The T-Bandage.—To keep a dressing on the lower part of the body, as after an operation for piles or for other purposes: Use flannel, calico, or other material. (1) With a *single-headed roller bandage*, choose a bandage 4 in. wide and 5 yd. long. Take a turn of the bandage round the lower part of the abdomen and tie a knot in the middle line in front; carry the bandage down between the legs and up behind between the hips, pass the head of the bandage beneath the turn at the back, then forwards between the legs and beneath the bandage round the trunk in front; repeat these turns backwards and forwards until four are made, and tie off the bandage in front. (Fig. 94.) (2) With a prepared T-bandage, take a strip of bandage 4 in. wide and 1½ yd. long; this piece is intended to encircle the body. To form the

T-piece, (*a*) sew one end of a piece of bandage 4 in. wide and 1 yd. long, behind, and tear (or cut) from the centre of the free end to the extent of half its length; or (*b*) behind, lay the centre of a bandage 4 in. wide and 2 yd. long across the centre of the strip which encircles the body. To apply the T-bandage, tie the part intended to go round the body with the knot in front; bring the T-piece forwards between the hips and thighs, and tie the ends to the bandage in front, one on either side of the knot.

Bandage for the Eyes.—To keep a dressing or pad on the eye, the bandage requires careful adjustment. After placing the pad or dressing on the eye, put the centre of a triangular bandage, or the centre of a strip of calico or linen 2 in. wide and 1½ yd. long, on the pad. One end is carried over the opposite side of the head, between the top and side of the scalp, to the back; the other end passes beneath the ear of the same side. The ends cross behind, and are brought forward so as to cover the previously-applied parts, and the knot is tied over the pad with a degree of tightness comfortable to the patient. In applying this bandage the whole trouble is to prevent the turn over the side of the head from slipping; unless it is kept well above the temple it is sure to slip.

A comfortable bandage that will stay in position on even a restless child may be applied on the lines of the mastoid bandage (*see* Fig. 85, p. 177). The head of the bandage is carried transversely round the patient's forehead away from the eye to be covered. The second turn on leaving the occiput is carried up under the ear, over the eye, and is pinned off.

Bandage for Amputation Stump.—An amputation stump is best bandaged by a suitable many-tail. A length of Gootch splinting should always be applied over the outer dressing. This affords additional support and tends to prevent undue twitching of the newly-cut muscles. It also prevents oozing

from the small blood-vessels, since pressure can be more effectively applied.

***Plaster-of-Paris Stiffening for Bandages.**—Plaster-of-Paris or other stiffening material is used with roller bandages: (1) as splints for fractures; (2) as a means of supporting a limb after splints have been removed; (3) as a jacket to support the spine when it is curved; and for several other purposes. To apply a plaster-of-Paris bandage to the leg, proceed as follows: Obtain two roller bandages of muslin, crinoline, or, if nothing else is handy, calico, 3½ in. wide and 6 yd. long; a flannel bandage 3 or 3½ in. wide and 5 yd. long; a quantity of plaster-of-Paris quite fresh and dry on a tray or dish, and a basin of cold water. Protect the bed with sheets of newspaper. Roll up the muslin bandages in the midst of the mass of plaster-of-Paris, so that they become thoroughly impregnated with the plaster; place the bandages in the basin of cold water, standing them first on end (see that they are thoroughly immersed in the water), afterwards lay them on their sides. Wash the limb with soap and water and dry thoroughly. Apply the flannel bandage from the toes to just below the knee, avoiding reverses as the bandage is being carried up the calf. In place of a flannel bandage some lint may be used, or, again, a long stocking may be put on the limb in place of a bandage. One plaster-of-Paris bandage, after all bubbles of air have ceased to escape from it, is removed from the water, slightly squeezed to get rid of superfluous water, and applied in the ordinary manner, care being taken to make plenty of figure-of-8 turns round the ankle so as to strengthen the bandage at this point. The second bandage is then continued up the leg to below the knee. The plaster bandages should be so applied that 1 in. of the flannel is left uncovered at the toes, ankle, and below the knee. The heel is usually left uncovered, and here also the flannel should project beyond the edge of the plaster bandage. In order

to strengthen and smooth the bandage, some plaster-of-Paris is made into a cream and smeared upon the folds of the plaster bandage as it is being applied, and the whole surface should be made to appear quite smooth by the cream. The heel should then be raised on a jar or pad and the part left uncovered, when it will set and dry in the space of an hour or two.

Particular care must be observed when this bandage is being applied that the toes are not pointed, but that the foot is kept at a right angle to the leg. If this is not done the patient cannot put the sole of the foot to the floor in walking.

In place of plaster-of-Paris, water glass, or silicate of soda, may be used to stiffen the bandage. This substance requires a long time (twenty-four hours) to harden and dry, but it has the advantage of being much lighter than plaster-of-Paris.

To remove these stiffened bandages it is necessary to use a strong knife or even a surgical saw; a special form of scissors is made for the purpose.

CHAPTER XXI

MOVING WOUNDED OR INJURED PATIENTS INDOORS—LAYING OUT THE DEAD

In Nos. 1 and 3 of the British Red Cross Society's Manuals minute instructions are given as to the carriage of patients from the street, or from the field of battle, to shelter in a tent, house, or hospital, by road or by rail. When the sick or wounded person arrives at his journey's end he has to be placed in bed ; this may necessitate his being carried upstairs (often quite narrow), and taken from the stretcher under awkward circumstances. Unless these movements are carefully carried out, all the care, skill, and labour that were bestowed upon the patient whilst being conveyed to the hospital may go for nothing ; a simple fracture may be made compound, or an arrested hæmorrhage may break out afresh.

On arrival at the tent, house, or hospital (temporary or permanent) a survey of the obstacles likely to impede the entrance of a loaded stretcher or other means of conveyance to the bedside must be made.

When a loaded stretcher is brought to a private house, or when the occupants of the house have been informed that a severely injured person is being brought for admission, all obstacles likely to obstruct entrance must, as far as possible, be removed. If the door is double, both sides must be opened ; in the hall, chairs, the hat-stand, the "grandfather's clock," if present, must be removed. If there is likely to be great difficulty in getting the stretcher upstairs, part of the balustrade may

have to be removed; if it is impossible to get the stretcher upstairs, a room must be prepared on the ground floor.

If the accident is known to be a fracture of a lower limb, a fracture bed is made up, as described at p. 20. A mackintosh should be spread beneath or laid upon the under-sheet and covered by a draw-sheet if necessary. The bed should be warmed with a warming-pan or hot bottles, and a sufficiency of blankets provided according to the season of the year; a fire should be lit if the weather is cold.

To get a stretcher into a room or up a staircase is always attended by some difficulty, which the bearers, by exercise of their ingenuity, may contrive to overcome. If it is impossible to get a stretcher upstairs the patient may have to be removed to a carrying-chair improvised for the occasion (*see* Manual No. 1, p. 190), should no regulation carrying-chair be at hand. If the entrances are narrow the traverses of the stretcher may have to be undone, so that the poles may approximate more closely; the V.A.D. improvised rope stretcher, being but 20 in. wide, will be more easily manipulated than the wider and heavier regulation stretcher; or it may be necessary to transfer the patient to a blanket stretcher. On the other hand, a "human stretcher" may be found the most suitable means of carriage, or the patient may have to be carried by three bearers standing on one side of him.

In carrying a stretcher up steps or a staircase, certain principles must be adhered to: (1) The stretcher must be kept as level as possible, so that the patient is kept in a horizontal position. (2) The patient should never be raised so high that the bearers cannot see him. (3) As a rule the patient is to be carried head first, but if a lower limb is fractured he must be carried feet first, so as to prevent the ends of the broken bone from being pushed violently against each other, or perhaps driven through the skin (compound fracture).

On arrival at the bed the stretcher (1) should be laid on the floor in a line with the bed (if there is room), the head of the patient towards the foot of the bed. The bearers then "stand to stretcher," Nos. 1, 2, and 3 on one side, and No. 4 on the other side, opposite No. 2, as in "Unloading Stretchers" (*see* B.R.C.S. Manual No. 3), and on the patient being raised they move by a side pace until over the bed, when the patient is lowered. If unfortunately the bed is a wide one, say a double bed, No. 4 will have to fall out as the bed is approached, and the carrying is left to Nos. 1, 2 and 3, standing as they do on one side of the patient. (2) Should there be insufficient space in the room to allow of the stretcher being placed in line with the bed, it must be brought alongside and parallel to the bed and lowered, with the head of the stretcher alongside the head of the bed. Nos, 1, 2, and 3 take post on the side of the stretcher away from the bed, lift the patient, and rise to the upright position, while No. 4 pulls the stretcher away from beneath the patient, Nos 1, 2, and 3 then advancing and gently laying the patient on the bed.

In moving a patient from an operating-table to bed, Nos. 1, 2, and 3 bearers stand upon whichever side of the patient will bring them, when the bed is reached, parallel to one side of the bed with the patient's head towards the head of the bed. When the operating table is parallel to the bed, or can be turned round to occupy this position, the procedure is simple; the three bearers place themselves on one side as in loading and unloading stretchers, and by a side pace the bed is reached, with the patient's head at the head of the bed. If. however, the operating table cannot be moved, as when it is improvised from, say, a biscuit box and flat (ironing) boards, a door, etc., or even if the table is made up of two placed together, as often happens when operating in a private house—under such conditions, especially if the room is small, a little planning will

be necessary before lifting the patient from the table and placing him on the bed.

A simple form of stretcher for carrying the patient from operating table to bed, or from the standard stretcher up a difficult staircase, consists in a strong canvas sheet with handles along the sides. No poles are required. This stretcher is placed under the patient in the same way as a clean sheet is inserted (*see* Fig. 4). Usually three or more bearers will be required to carry the patient.

Laying out the Dead.

This is a solemn duty, and should be done with reverence and in silence. Shortly after death the condition called *rigor mortis* sets in, as a result of which all the muscles become rigid.

When death occurs, the nurse, as soon as the friends have left the bedside, should close the eyelids; if necessary, keeping the lids in position with pads of wet wool. The body is then laid straight, and the mouth closed. The lower jaw is supported by means of a roller bandage. All rings, other jewellery, and false teeth are removed unless directed otherwise by the relations. Tie the ankles and big toes together.

About an hour after death the nurse should proceed to remove all bedclothes, air-rings, etc., leaving only a long mackintosh; and commence to wash the body with water containing a weak disinfectant, using plenty of soap. Cut and clean the nails, plug all orifices, such as rectum, vagina, and nose with non-absorbent wool. In surgical cases remove tubes or other appliances, and re-cover the wound, after cleaning it, with gauze and a bandage. No pins should be used, but bandages, etc., should be stitched. Comb and brush the hair. Dress in clean nightdress and stockings. The arms may be folded or placed at the sides. Put in a clean under-sheet and pillow slip. Cover the body as far as the

chin with another clean sheet, and place a clean handkerchief over the face.

If in hospital, the name of the patient, date of death and name of the ward are written on a piece of paper, which is attached on to the top sheet, and removed with the body to the mortuary.

APPENDIX

GRADED MILKS

Supplementing the information given in the second paragraph of Chapter VII (p. 37), it should be stated that four grades of designated milks are now recognized. Milk not coming within the scope of the designations is known as undesignated milk, and may be sold loose, bottled or in any other way. Designated milks for sale to the general public must be bottled and sealed on premises approved by the Local Health Authority; bottling of these milks on any other premises is illegal.

The graded milks are known as Certified Milk, Grade A Tuberculin Tested (T.T.), Grade A, and Pasteurized. These milks have different standards to which the producer must conform.

Certified Milk is milk from tubercle-free cows. It must only be bottled on the farm where it is produced under licence from the Ministry of Health. A high standard of cleanliness must be maintained, viz. less than 30,000 organisms per c.c. of milk and no Bacillus coli in one-tenth of a c.c. This is a stringent standard. The bottles in which it is sold must be labelled Certified Milk, together with the Producer's name and address and the day of milking.

Grade A (T.T.) is milk having the standard of cleanliness of Grade A (*see* below), but produced from Tuberculin-tested herds.

Grade A Milk is milk produced on approved farms from cattle subjected to veterinary inspection every three months. The standard of cleanliness is not so high as for Certified Milk; 200,000 organisms per c.c. must not be exceeded and no Bacillus coli in less

than one hundredth of a c.c. There is no guarantee against the presence of tubercle bacilli. Conditions of labelling are practically the same as those for Certified Milk. This milk is produced under licence of the Local Authority.

These three kinds of designated milks are all untreated, and are milks "as they come from the cow."

Pasteurized milk, however, is milk subjected to treatment by heat in order to kill organisms that may be present. The government regulations state that the milk must be held at a temperature between 145° F. and 150° F. for a period of thirty minutes and then rapidly cooled. Pasteurized milk must be labelled as such, and is produced under licence of the Local Authority.

As large quantities of bottled milk are sold now-a-days, it is important to remember that it is not necessarily "graded" milk. Graded milks have their designations, "Certified," Grade A (T.T.), Grade A, or Pasteurized, plainly marked on the bottle or the cap.

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